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Clean Harbors Kansas, LLC RCRA Permit Application Part B

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Clean Harbors Kansas, LLC

Part B Renewal Application

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M-1 Introduction

This section addresses groundwater monitoring per 40 CFR 270.14. Information contained in this section has been summarized from the results of a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of the Clean Harbors Kansas, LLC facility (the facility). The information in this section is based on that RFI. A copy of which is located in section L Appendix L-A .The site was formerly owned by Safety-Kleen (Wichita), Inc. The subject site is located at 2549 New York Avenue, in an industrialized area of Wichita. The RFI report was originally submitted to the United States Environmental Protection Agency (USEPA) and the Kansas Department of Health and Environment (KDHE) on January 20, 2003. The revised RFI report was submitted in October 2004. An RFI Addendum was submitted to the agencies on August 29, 2005 and additional amended text for inclusion in the RFI was submitted on January 20, 2006. The RFI and RFI Addendum were approved with comment by the EPA on April 28, 2006. Clean Harbors Kansas continues to work with KDHE and USEPA as part of the on-going corrective action program.

The RFI work was conducted in several phases beginning in November 1999. The work focused on an evaluation of the nature and extent of soil and groundwater quality impacts at various solid waste management units (SWMUs), areas of concern (AOCs), and several other areas (OAs) identified at the facility as part of the RFI. Each phase of work was conducted according to a USEPA approved work plan. The Phase I RFI Work Plan (Environmental Decision Group, Inc., 1999) was initially prepared in 1998 and final approval was received from the agencies on December 2, 1999. The Phase I

Work Plan identified the initial sampling activities and provided a description of investigation methodologies, standard operating procedures (SOPs), and a Quality Assurance Plan (QAP) for the RFI. Subsequent phases of work were conducted in accordance with approved work plan addenda consisting primarily of a Phase II Work Plan (Cameron-Cole, 2001) approved November 6, 2001, and a Phase III Work Plan (Cameron-Cole, 2002) approved July 18, 2002. The work plans and RFI activities were completed on behalf of Clean Harbors Kansas by Cameron-Cole, LLC, formerly Safety-Kleen Consulting, formerly, the Environmental Decision Group.

The facility lies within the North Industrial Corridor (NIC) site, which is a large industrialized area within Wichita that has been identified as having a dissolved groundwater plume of chlorinated volatile organic compounds (VOCs) present. Many potential responsible parties that currently own or previously owned property within this industrialized area are involved in the NIC investigation. As previously agreed upon by the agencies, the data collected for the purposes of the RFI will also serve as a potential source area investigation for the site with respect to the NIC chlorinated VOC plume.

The site is currently permitted to conduct regulated waste management activities including the management of paints and related wastes, batteries, fluorescent lights, incinerable hazardous solids, lab packs, mercury, household hazardous waste, off-specification and production wastes from industries, chlorinated and non-chlorinated petroleum-based waste solvents, plating wastes, and corrosives. Wastes that are received at the facility are directed to an appropriate off-site facility for final management.

The site is approximately six acres in size and lies within an industrialized area of north-central Wichita, Kansas. The property has been used for manufacturing and/or chemical waste handling for approximately 60 years. The site lies within the North Industrial Corridor (NIC), which includes most of the industrial corridor near the facility. The NIC, which includes over 4,000 acres of property, is undergoing its own environmental investigation of a dissolved chlorinated VOC plume under the supervision of the City of Wichita, with oversight by KDHE.

M-2 Hydrogeology

The local shallow geology is comprised primarily of permeable alluvial sediments and terrace deposits underlain by the Wellington Shale, which is approximately 200 feet thick in the site vicinity. The unconsolidated sediments below the site are primarily gravelly clay with silt to approximately 7 to 17 feet, underlain by a sand unit, approximately 9 to 17 feet thick. A 2 to 4 foot thick clay layer is then encountered across most of the site, with the exception of the southwestern corner. Another 8 to 9 feet of sand underlie the clay. As mentioned above, these unconsolidated sediments are underlain by the Wellington Shale.

The depth to groundwater is generally less than 15 feet below ground surface (bgs) in the site vicinity. Across most of the site, the alluvial aquifer is separated into an upper and lower zone. Groundwater in the upper zone occurs under water table conditions and is approximately 10 to 12 feet thick. It is underlain by a clay unit approximately 2 to 4 feet thick. This clay layer pinches out in the southwestern portion of the site. The lower zone of the alluvial aquifer is under semi-confined conditions across most of the site, bounded by the 2 to 4-foot thick clay layer above and the Wellington Shale below. The saturated thickness is generally 8 to 9 feet.

The direction of groundwater flow has been consistently south/southeast across the site. Groundwater flow is toward the East Fork of Chisholm Creek located about 150 feet east of the site. Based on the information in the RCRA facility Investigation, the creek is a gaining stream, accepting base flow from groundwater. This is consistent with a comparison of the elevation of groundwater to the elevation of the creek, which indicates groundwater discharges to the creek. The creek flows from north to south and is the closest surface water body to the site. A groundwater reinjection system has been operated by the refinery on the property to the south of the facility. When in operation, this system may divert the natural groundwater flow toward the East Fork of Chisholm Creek in a slightly more easterly direction.

The hydraulic conductivity of the alluvial aquifer in the site vicinity is estimated at 135 feet per day to 435 feet per day with a hydraulic gradient of between 0.002 and 0.003. The estimated flow (i.e., seepage) velocity of the groundwater is between 400 and 1,300 feet per year. A slight upward vertical gradient exists across most of the site, confirming that the lower zone is under semi-confined conditions in most locations. In view of the 2 to 4-foot thick clay layer and the upward vertical gradient, the downward migration of dissolved constituents from the upper zone to the lower zone is very limited.

M-2A Regional Hydrogeology

The depth to groundwater in the site vicinity is generally less than 15 feet bgs (CDM, 2002), occurring in the sandy alluvial and terrace deposits. These deposits comprise a shallow alluvial aquifer. The alluvial aquifer is reportedly used for irrigation, household gardening, and industrial applications (CDM, 2002). While this aquifer is an important source of groundwater in general within Sedgwick County (PRC, 1990), little groundwater is used within the industrialized area that includes the NIC site. A City of Wichita ordinance *(Ord. NO. 43-156 S 2)* is in place that does not allow groundwater use within the NIC for household or domestic purposes: however it is still potentially used for industrial purposes. In the NIC Draft Baseline Risk Assessment (BLRA) (CDM, 2002b) the City of Wichita has indicated that isolated cases of groundwater use within the NIC have been identified, however, specific information has not been provided in the BLRA. The City has indicated (CDM 2002c) it is in the process of confirming groundwater use for water supply at other properties and terminating use as appropriate under the ordinance. The Arkansas River Alluvium underlines the Clean Harbors Facility

Although the alluvium and terrace deposits are stratified and lenticular in occurrence, the sand and gravel beds are interconnected. Therefore, the stratified unconsolidated beds respond to long-term withdrawals of groundwater as a single hydraulic unit. Fully penetrating wells within the alluvial aquifer of the Arkansas River Valley may yield up to 2,000 gallons per minute (gpm) (Lane and Miller, 1965). Wells screened in the shallow terrace deposits may yield 500 to 1000 gpm. An area between Wichita, Newton, and Hutchinson contains deposits of clay, silt, and gravel referred to as the "Equus Beds Aquifer". The Wichita well field, located approximately 20 miles northwest of the city and upgradient of the site, is one of the primary potable sources of water for the city (CDM, 2002). The City of Wichita also reportedly maintains water supply wells in the Arkansas River alluvium between the Arkansas and Little Arkansas Rivers. The Arkansas River alluvium is considered a drinking water aquifer.

The saturated unconsolidated deposits in the site vicinity provide much greater yields than the fine-grained shale bedrock. Regionally, groundwater is obtained at yields less than 10 gpm (Bevans, 1989) from the weathered zone of the Wellington Formation, and it may be highly mineralized (PRC, 1990).

The vicinity groundwater flow direction identified in the NIC Remedial Investigation (RI) Report (CDM, 2002) is south to southeastward in the middle portion of the site (near the facility) and southern portion of the NIC site (south of the site). The East Fork of Chisholm Creek is reported to be a gaining stream in the NIC RI Report, which means a stream receiving baseflow groundwater recharge (CDM, 2002).

Precipitation is the primary source of recharge in the Arkansas River Valley. The approximate net average recharge to the unconsolidated deposits in the Arkansas Valley is 20% of the annual precipitation (or six inches in years of normal rainfall).

M-2B Site Hydrogeology

The discussion below on the site hydrogeology is based primarily upon information obtained from monitoring wells installed in the upper portion and the lower portion of the alluvial aquifer (i.e., the portion below the clay layer). These wells were surveyed and gauged over the course of the RFI field efforts. The following is a summary of the findings for the site hydrogeology. The discussion has been divided into separate sections for the upper and lower zones of the aquifer. A two to four foot thick clay layer separates these flow zones across much of the site.

M-2B1 Upper Zone

Based on monitoring data collected at the facility since November 1999, the depth to groundwater at the site is typically 12 to 16 feet bgs, but can vary a foot or more based on recent precipitation events. The saturated portion of the alluvial aquifer is 21 to 23 feet thick in total. It is underlain by clay that functions as a shallow semi-confining unit within the alluvial aquifer beneath the site. Groundwater occurs in the upper sand zone under water table conditions.

The direction of groundwater flow identified in the upper zone in each gauging event has been to the southeast. The direction of flow is consistent with that shown for the aquifer as a whole based on the NIC investigation data. Based on RFI data, the direction of flow and gradient are consistent. The hydraulic gradient varies from approximately 0.002 to 0.003.

A comparison of surface water elevations to groundwater elevations from the November 2001 and August 2002 potentiometric surface maps suggests that groundwater in the shallow zone of the alluvial aquifer may be hydraulically connected to the East Fork of Chisholm Creek.

Quantitative estimates of hydraulic properties have been generated from work performed as part of the NIC activities. The hydraulic conductivity varies throughout the NIC site, ranging from 135 feet/day to 435 feet/day. A pumping test conducted near 22nd Street and Broadway resulted in an estimated hydraulic conductivity of 185 feet/day (CDM, 2002). The velocity of groundwater flow (i.e., seepage velocity) for the shallow portion of the alluvial aquifer can be estimated from Darcy's Law by multiplying the hydraulic conductivity by the hydraulic gradient, and dividing that value by the effective porosity of the formation. Using an estimated effective porosity of 0.3, a hydraulic gradient of 0.0025, and the range of hydraulic conductivities provided above, the estimated groundwater flow velocity is from 400 to 1,300 feet/year.

M-2B2 Lower Zone

Groundwater occurs in the lower zone under semi-confined conditions across most of the site based on observations during drilling as noted on boring logs. The extent of the clay lens upgradient and downgradient of the Clean Harbors facility has not been fully determined and vertical stratification of contaminants in the aquifer also occur where this clay lens is absent. These conditions are a result of the overlying two to four foot-thick clay layer. The clay is encountered below most of the site at an approximate elevation of 1288 to 1290 msl. This clay is expected to retard downward migration of shallow groundwater and associated dissolved constituents to the deeper zone of the alluvial aquifer over areas of the site where the clay lens is present. The clay pinches out in the southwestern portion of the site. The weathered bedrock and shale bedrock at the base of the alluvial aquifer provide a barrier to downward migration of groundwater and dissolved constituents in the lower zone of the alluvial aquifer, to deeper units.

An evaluation of the groundwater flow direction in the lower zone of the alluvial aquifer was conducted for comparison to the shallow zone. This review indicated that the groundwater flow direction in the lower zone is to the south-southeast, which is similar to the upper zone.

Groundwater elevations collected for the five well pairs at the site were compared to evaluate the direction and magnitude of the vertical gradient between the upper and lower zones of the aquifer. The data are listed below:

	SK-1 S/D		SK-2 S/D		SK-3 S/D		SK-4 S/D		SK-5 S/D	
Date	*dHH*	*Vgrad*	*dHH*	*Vgrad*	*dHH*	*Vgrad*	*dHH*	*Vgrad*	*dHH*	*Vgrad*
10/26/2000	1.02	0.073	0.05	0.003	0.95	0.053	NDA	NDA	-0.27	-0.016
4/25/2001	0.53	0.038	0.05	0.003	-0.16	-0.009	NDA	NDA	0.01	0.001
11/12/2001	0.65	0.046	0.17	0.011	0.01	0.001	0.21	0.016	0.16	0.01
8/23/2002	0.53	0.038	0.01	0.001	-0.1	-0.006	0.19	0.014	0.01	0.001
10/19/03	1.21	0.086	0.37	.023	0.18	0.010	-0.06	-0.004	0.27	0.016
10/21/04	0.9	0.064	0.23	.014	0.06	0.003	-0.01	-0.001	0.16	0.010

dHH = Difference in hydraulic head (positive is an upward gradient; negative is a downward gradient)

Vgrad = Estimated Vertical Gradient

NDA = No Data Available

The values labeled "dHH" provided in the preceding table represent the difference in hydraulic head (as measured in feet msl) between water levels measured in each well pair. The column labeled Vgrad represent the estimated vertical gradient between the lower and upper portions of the alluvial aquifer, which takes into account the approximate vertical distance between the midpoint of the deeper screen and the midpoint of the saturated shallow screen interval.

The positive values indicate that in each well pair the potentiometric surface (i.e., the groundwater elevation) in the deeper zone was generally higher than the potentiometric surface in the shallow zone. Those differences in head (dHH) values greater than 0.1 are considered significant differences in hydraulic head. The overall hydraulic head differential data collected between October 2000 and October 2004 demonstrates that a slight upward vertical hydraulic gradient generally exists in the deeper zone of the alluvial aquifer in the vicinity of well pairs SK-1S/1D and SK-2S/2D, and to a lesser extent at well pair SK-5S/5D at the site. This data suggests that the clay layer in the vicinity of these well pairs may act as a semi-confining unit within the alluvial aquifer, and may impede the downward migration of dissolved constituents to the lower aquifer zone. The magnitude of the head differential appears to decrease in the well pairs (SK-3S/3D and SK-4S/4D) on the western side of the site, where the clay unit pinches out.

Immediately to the south and downgradient of the facility, petrochemical manufacturing, production, and refining activities have been conducted at the El Paso Corporation Refinery since 1920 (CDM, 2000). This groundwater elevation data was obtained from CDM's March 2001 potentiometric surface map for the NIC site. The operation of recovery wells and a re-injection system may affect the natural groundwater flow system locally in this area as indicated by work conducted by El Paso. The recovery and re-injection system was designed in 1994 and operations were phased in over a period of time beginning in 1995. The water pumped from the ground is re-injected after treatment through a series of 40 injection wells located at the north end of the facility, approximately 300 feet south of the facility property. At the northeastern margin of the El Paso property, well RW-20 has historically had been operated as a groundwater recovery well for hydraulic control in connection with the operation of the injection system, pumping at a rate of about 10 gallons per minute (gpm). The operation ceased about 5 years ago.

M-3 Groundwater Monitoring

Ten groundwater monitoring wells were installed in the shallow and deeper portions of the unconsolidated aquifer below the site. These wells were surveyed, developed, sampled and gauged as part of the Phase I RFI. Six shallow wells were installed in the uppermost zone of the alluvial aquifer (SK-1S through SK-6S) with 15-foot length screens. Deeper zone wells SK-1D, SK-2D, SK-3D and SK-5D were installed with 5-foot length screens just above the Wellington shale, at the base of the unconsolidated aquifer. Also included in the monitoring program were HRI-03 and RSC-1 (fully penetrating wells in the alluvial aquifer that were installed prior to the RFI). Selected wells on UPRR's site also were included in the monitoring program to assess upgradient conditions. These included MW-10, MW-11, MW-14, and WND-32S.

Two off-site shallow wells (SK-10S and SK-11S), one on-site shallow well (SK-B68), and one on-site deep well (SK-4D) were installed in the alluvial aquifer as part of the Phase II RFI. SK-10S and SK-11S are located southeast and downgradient of the site, east of New York Avenue, and west of the East Fork of Chisholm Creek. SK-4D was installed adjacent to SK-4S to complete another well pair. SK-B68 was located between the processing area and Building D to assess impacts to the groundwater from constituents detected in soil at B-68 and B-21.

Another complete round of groundwater sampling was conducted on the existing monitoring wells during November 2001. Well WND-32(D) was added to the monitoring program during the Phase II work. This well was installed on UPRR property by CDM as part of the NIC Remedial Investigation in July 2001. Well WND-32D is a deep well screened in the lower zone of the shallow aquifer and is located adjacent to WND-32(S). WND-32(S) is screened in the upper zone of the shallow aquifer.

In addition to the collection and analysis of groundwater samples from monitoring wells, groundwater grab samples were also collected at selected GeoProbe® soil borings. These samples were collected to assess whether impacted soil affected groundwater and to aid in locating potential source areas.

During October 2004, three deep monitoring wells (SK-7D, SK-8D, and SK-9D) and one shallow well (SK-8S) were installed to complete the assessment of groundwater quality upgradient of the facility. Sampling and analysis details are incorporated in the RFI. A Long-term Sampling and Analysis Plan will be developed and implemented in the future and modified as necessary.

M-4 Site-Wide Groundwater Quality

With respect to groundwater quality, characterization of the upgradient groundwater quality was especially important at this facility since the NIC site has widespread chlorinated hydrocarbon contamination in the groundwater. As determined from sampling during the RFI, constituents detected in groundwater migrating on site from upgradient sources include concentrations of chlorinated hydrocarbon compounds and aromatic hydrocarbon compounds. The chlorinated hydrocarbon compounds include TCE (up to 200 μg/L), cis-1,2-DCE (up to 45 μg/L), chloroform (up to 44 μg/L), and carbon tetrachloride (up to 17 μg/L).

Impacts to the groundwater at the site as a result of historical operations on the Clean Harbors facility appear to be limited for the most part to the upper zone of the alluvial aquifer. The vertical migration of constituents in the upper zone to the lower zone is impeded by a clay layer that occurs over much of the site, and by a slight upward vertical gradient. Constituents detected in the deep zone in the 2005 sampling events were primarily those constituents observed in the deep zone at upgradient wells, cis-1,2 DCE and TCE. PCE was detected at low concentrations in SK-2D in April 2005 and at trace concentrations in SK-3D, SK-4D, and SK-12D in February, April, and July 2005, but was also detected in deep upgradient well WND-32D in April and July 2005.

A chlorinated hydrocarbon signature is present in groundwater from each of the wells installed in the upper zone across the site. All shallow wells show at least low levels (in the range of 5 to 100 µg/L) of PCE, TCE, and cis-1,2 DCE. Based on characterization of upgradient groundwater quality, it appears that the widespread occurrence of TCE and cis-1,2 DCE is at least in part explained by the occurrence of these constituents in upgradient groundwater quality. The occurrence of PCE appears primarily attributable to site impacts. Although of lesser prevalence than TCE, cis-1,2-DCE, and PCE, twelve additional VOCs were identified in the site groundwater exceeding the Region 9 PRGs or MCLs. It should be noted that concentrations of naphthalene on site do not exceed the concentrations observed upgradient of the facility. In addition, the carbon tetrachloride and chloroform, a degradation product of carbon tetrachloride, occur at concentrations similar to, but slightly less than those observed in shallow upgradient well WND-32S. These constituents are considered to originate from upgradient sources.

The area of greatest impact to groundwater on site is the area downgradient of the Process Area Storage Tanks and the Elevated Tank Storage Area (SWMUs # 1 and 7). Groundwater impacts in this area consist predominantly of cis-1,2 DCE and PCE ranging in concentrations up to 1,500 and 1,100 µg/L, respectively, in monitoring wells and up to 11,000 and 1,800 µg/L, respectively, in Geoprobe water samples. This area of impacts is defined by monitoring well data at SK-2S, SK-5S, SK-B68. Concentrations of cis-1,2 DCE, PCE, and TCE at these wells each occur at values greater than the MCLs of 5, 5, and 70 µg/L, respectively. Groundwater quality impacts are observed to the west and east of the process area and Building D, but at lower concentrations. Groundwater quality impacts also occur in the vicinity of the former Paint Can Burial Pit (SWMU #20). The constituents include a variety of substituted aromatic compounds consistent with a paint-related source. This area is likely associated with the historic manufacturing of paint at the facility.

The impacts to groundwater associated with the facility migrate southeast, toward the East Fork of Chisholm Creek. The concentrations decline significantly toward the creek, but occur in offsite monitoring well SK-10S at values above the MCLs for PCE, TCE, cis-1,2 DCE, and VC. The creek may be a hydraulic barrier to groundwater migration further to the east; however, it has not been fully assessed. Additional evaluation of the interaction between thwe groundwater and the creek will be conducted as required by EPA.

M-4A Upgradient Groundwater Quality

Characterization of the upgradient groundwater quality was especially important at this facility since the NIC site has widespread chlorinated hydrocarbon contamination in the groundwater. Characterization of the upgradient impacts may help discriminate between the impacts attributable to, or originating from the site, from that of the NIC plume(s).

The following monitoring wells are located within 200 to 600 feet upgradient of the facility: SK-7D, SK-8S, SK-8D, SK-9D, MW-10, MW-11, MW-14, MW-15, MW-18, WND-32[S] and WNC-32[D]. During October 2004, the facility installed three additional deep upgradient wells (SK-7D, SK-8D, and SK-9D) and one additional shallow upgradient well (SK-8S) on UPRR property to complete the upgradient assessment of groundwater quality (Phase II Work Plan). The locations of wells SK-7D and SK-9D were chosen to create nested well pairs with the existing UPRR shallow upgradient monitoring wells. Upgradient monitoring was conducted on five existing wells (MW-10, MW-11, MW-14, WND-32[S] and WNC-32[D]) on UPRR property from April 2001 through October 2004, and at two existing wells (MW-15 and MW-18) during October 2003 and October 2004. The newly installed wells were sampled once during October 2004. Groundwater samples from each of the wells were analyzed for VOCs by EPA Method 8260B, in addition to the other groundwater monitoring constituents. Based on groundwater monitoring data within the RFI report, the following constituents occur in upgradient groundwater that may be migrating onto the site.

Upgradient Groundwater Constituents	Maximum Concentration Detected April 2001 to October 2004 (μg/L)
Carbon Tetrachloride	17(S)
Chloroform	44(S)
Cis-1,2-Dichloroethene	45(D)/3.9(S)
Methylene Chloride	1.2(S)
Napthalene	150(S)
Trichloroethene	200 (D)/ 13(S)
n-propylbenzene	11(S)
sec-butylbenzene	10(S)

n-butylbenzene	15(S)
1,2,4-trimethylbenzene	1.6(S)
1,1,2,2 tetrachoroethane	50(S)

Note: (D) = Maximum concentration in deep well; (S) = Maximum concentration in shallow wells

Until October 2004, the only well pair upgradient was WND-32(S) and WNC-32(D), north of the northwest corner of the site. Carbon tetrachloride (CCl_4), chloroform, cis-1,2-DCE, methylene chloride and TCE were detected in WND-32(S) from April 2001 through August 2002. These constituents were not detected during October 2003 and October 2004. Cis-1,2-DCE and TCE were detected in the deep well of the pair. TCE was detected in shallow wells MW-10, MW-14, MW-15 and SK-8S at concentrations ranging from 2.6 to 14 μg/L. Cis-1,2-DCE was also detected in MW-10, MW-11, MW-14, MW-15, and SK-8S at concentrations ranging from 1.0 to 3.9 μg/L. Concentrations of TCE and cis-1,2-DCE were detected in each of the newly installed deep wells (SK-7D, SK-8D, and SK-9D) with the concentrations of 200, 40, and 47 μg/L and 45, 2.2, and 8.3 μg/L, respectively.

These results indicate upgradient sources of TCE and CCl_4. (Chloroform and cis-1,2-DCE are probable degradation products of the CCl_4 and TCE, respectively.) Likewise, naphthalene was detected at 89 to 150 μg/L in MW-10. This may be creating the detection of naphthalene observed in SK-2S. The high detection of naphthalene may have masked detections of TCE in MW-10, since the detection limits were elevated to quantify the naphthalene present during April and November 2001. (Note: TCE of 13 μg/L was reported in August 2002, October 2003 and October 2004 when the detection limits were not as elevated.)

Historical data collected from the upgradient wells WND-31S and WNC-32S in connection with the NIC indicate that concentrations of chlorinated hydrocarbons have been detected upgradient of the facility consistently since at least 1991. Groundwater monitoring indicates concentrations of TCE just upgradient of the site as being on the order of 20-100 μg/L in both the shallow and deep portions of the aquifer, and concentrations of cis-1,2-DCE as being on the order of 20 μg/L. Constituents consistently detected upgradient in historical data collected in connection with the NIC included carbon tetrachloride (maximum concentration 140 μg/L), chloroform (120 μg/L), PCE (6.9 μg/L), and TCE (maximum concentration 21 μg/L), among others from data collected between 1991 and 1997.

M-4B Facility Groundwater Quality

M-4B1 VOCs – Upper Zone

A chlorinated hydrocarbon signature is present in groundwater from each of the wells across the site. All shallow wells show at least low levels (in the range of 5 to 100 μg/L) of PCE, TCE, and cis-1,2 DCE. Based on the upgradient groundwater quality, it appears that the widespread occurrence of TCE and cis-1,2 DCE maybe attributed in part to the upgradient groundwater quality conditions; however, since the shallow concentations onsite are often higher than those upgradient, there may be onsite sources for these constituents. The occurrence of PCE appears largely attributable to site activities.

Based on the results of the source characterization, existing impacts to groundwater quality at the site occur above screening levels in five, relatively discrete areas (each with some overlap). These are, from west to east across the site, as follows:

- The western portion of the property;
- The area of the former buried paint can pit;
- The process area and Building D area in the center of the property; and
- The northeastern corner of the property.
- The southeast portion of the site, in the vicinity of monitoring wells SK-1S/1D.

The western area is encompassed by SWMU #18, the Open Area Along the Southwest Corner and SWMU #24, the Area South of Building C, and includes SWMU #17, the Former Dry Solids Gondola. Groundwater quality in this area contains low concentrations of PCE, cis-1,2 DCE, TCE, TCA, carbon tetrachloride and chloroform. The carbon tetrachloride and chloroform, a degradation product of carbon tetrachloride, occur at concentrations similar to, but slightly less than that observed in shallow upgradient well WND-32S, and these constituents appear to originate from upgradient sources. Of the remaining constituents detected in groundwater samples from monitoring wells and Geoprobe® locations, only PCE and TCE occur above MCLs (5 µg/L), ranging in concentration up to 1300 and 190 µg/L, respectively. Although TCE is detected on site at concentrations similar to those upgradient, TCE is also a degradation product of PCE, which appears to be at higher concentrations on site.

At the former buried paint can pit, SWMU #20, several VOCs were detected at the SK-3 and SK-5 well pairs that were not detected at the other monitoring wells. These

VOCs are generally described as substituted benzene ring (aromatic) compounds. The following VOCs are unique to the SK-3 and SK-5 well pairs.

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- n-Butylbenzene
- n-Propylbenzene
- Isopropylbenzene
- p-Isopropyltoluene
- Naphthalene

The aromatic compounds toluene, ethylbenzene, and xylenes (TEX) were also detected. These TEX constituents are commonly associated with fuel related compounds when benzene is present. The fact that benzene is not detected, combined with the detections of the other substituted aromatics, is consistent with the TEX compounds being associated with the former paint company operations, rather than related to any fuel source. Of these aromatic compounds detected in this area of the site, naphthalene, 1,3,5 trimethylbenzene and 1,2,4 trimethylbenzene exceeded Region 9 PRGs during several sampling events. MCLs are not available for these constituents. PCE and TCE detections in these groundwater samples exceed MCLs based on the groundwater sampling events conducted from October 2000 through October 2004.

In the vicinity of and downgradient of the process area and Building D, groundwater impacts occur that consist predominantly of aromatic hydrocarbons, and cis-1,2 DCE and PCE ranging in concentrations up to 1,500 and 1,100 µg/L, respectively, in monitoring wells and up to 11,000 and 1,800 µg/L, respectively, in Geoprobe water samples. The highest concentrations of cis-1,2 DCE and PCE observed at the site were detected at boring B-21. The concentration of cis-1,2 DCE generally occurs at a value equal to or greater than PCE. Concentrations of PCE, TCE and cis-1,2 DCE each occur at values greater than the MCLs of 5, 5 and 70 µg/L, respectively.

The northeastern area of groundwater quality impacts includes OA #6 and the area south of Building J. Monitoring wells SK-6S located within OA#6, and SK-1S and SK-10S downgradient of Building J contain low concentrations of PCE, cis-1,2 DCE and TCE near or below the MCLs In addition, south of Building J, VC was detected in the GeoProbe® water samples and is observed above the MCL of 2 µg/L in downgradient monitoring wells SK-1S (3.6 µg/L) detected in October 2003 and SK-10S (59 µg/L) detected in November 2001. Several Geoprobe water samples collected from areas within and downgradient of OA#6 and south of Building J contained PCE, cis-1,2 DCE and TCE above MCLs.

The southeast area of groundwater quality impacts at the site occur in the vicinity of monitoring wells SK-1S/1D. Impacts in this area include PCE, TCE, cis-1,2-DCE, and VC. PCE concentrations at SK-1S ranged from 1.4 to 24 µg/L with concentrations exceeding the MCL of 5 µg/L during three of the six sampling events. VC exceeded the MCL of 2 µg/L in one sample collected during October 2003 (3.6 µg/L). GeoProbe® water samples collected from core boring EB-5 and B-79 contained elevated concentrations of PCE, TCE, cis-1,2 DCE, and VC above the MCLs for these constituents.

M-4B2 VOCs – Lower Zone

Most of the facility is underlain by a low permeable clay layer that would retard the downward migration of the dissolved groundwater constituents. A comparison of the results in shallow and deep well pairs does reflect appreciable differences in groundwater quality between the upper zone and lower zone. These are most evident in the SK-3S/3D pair. Constituents detected at high levels in the shallow wells do not occur in the deep zone. Similarly, PCE, which occurs across the site in the shallow zone, is absent in the deep zone, with the exception of detections that are less than 5 µg/L at SK-4D and a one-time detection of 66 µg/L in SK-3D in October 2000 that has not been observed again. However, SK-4D is located in the southwestern portion of the site where the clay pinches out. The only other constituents consistently detected in the deep zone are the two constituents noted in the deep zone upgradient wells, cis-1,2 DCE and TCE. The concentrations of these constituents in the deep zone wells at the facility are comparable to upgradient values and indicate their origin is most likely associated with upgradient groundwater impacts.

M-4C Groundwater Quality Conditions Downgradient of the Facility

Groundwater quality data for VOCs is available for a number of monitoring wells and GeoProbe® samples on the El Paso Refinery property in the area just south of the site but upgradient of the re-injection wells. Groundwater quality in this area is of interest in assessing the extent of migration from the facility. Monitoring wells for which VOC data are available (July 2000 data) are MW-1, MW-3, and MW-380. The El Paso Refinery has also sampled the groundwater from recovery well RW-20 for VOCs. GeoProbe® water samples in this area, collected recently on the El Paso property as part of the NIC investigation, include GP10F-02 through GP10F-05. Cameron-Cole split samples from the GeoProbe® locations GP10F-04 and GP10F-05 during sampling in March 2000.

Of the wells listed, only MW-3 and RW-20 are directly downgradient of the facility and these wells only penetrate the shallow zone of the aquifer. Monitoring well MW-380 was located east of the East Fork of Chisholm Creek. MW-380 was destroyed during construction activities along Interstate 135. MW-3 shows cis-1,2 DCE at 14 μg/L, which is a constituent observed in the shallow zone in the facility wells and other upgradient monitoring wells. The well sample also contained 2,2 dichloropropane, which has not been detected on the site. Groundwater recovery well RW-20 has low levels of PCE, TCE, and cis-1,2 DCE. All of these constituents occur at concentrations less than the MCLs.

Of the GeoProbe® samples analyzed in March 2000, only GP10F-04 and GP10F-05 are directly downgradient of the facility. Water samples at these locations were collected from three different depth intervals in the aquifer: the shallow, middle, and deep zones. The shallow and deep samples correspond to the upper and lower zones of the aquifer sample in wells on the site. It is not clear whether the 2 – 4 foot thick clay layer observed on the site occurs at these offsite GeoProbe® locations, and whether middle zone samples are above or below this layer. The samples show a number of both petroleum hydrocarbon and chlorinated constituents. Concentrations generally decrease in the deeper samples. The exceptions are the concentrations of TCE and cis-1,2 DCE in GP10F-04 and GP10F-05, which are highest in the deepest sample.

In January 2003, KDHE installed and sampled Geoprobe boring MIP/GW-6 (13-17') on the El Paso refinery property. The analytical results indicate the occurrence of chlorinated constituents similar to those in the shallow aquifer zone of the facility. TCE and cis-1,2-DCE exhibit the highest concentrations of constituents detected in this Geoprobe.

M-5 General Groundwater Chemistry

Groundwater samples were collected for analysis of selected inorganic constituents in order to assess groundwater quality in terms of general geochemistry parameters and non-target compounds. The following analyses were performed for the groundwater samples collected from the monitoring well network during October 2000, April 2001, November 2001, and August 2002 sampling events.

- Dissolved Gases – Methane, Ethane, and Ethene
- Dissolved Metals – Calcium, Iron, Potassium, Magnesium, and Manganese
- Total Metals – Iron and Manganese
- Total Dissolved Solids
- Alkalinity
- Nitrate as Nitrogen
- Sulfate
- Chloride
- Total Organic Carbon

Additionally, in-situ (down-hole-probe) water quality measurements, and field analysis of ferrous iron (Hach Kit), were performed beginning with the November 2001 sampling event. These analyses were performed to further assess groundwater geochemistry at the facility, and to evaluate conditions that may promote natural attenuation of contaminants.

- Dissolved Oxygen
- Oxidation Reduction Potential
- Temperature
- pH
- Ferrous Iron

During the October 2003 annual sampling event, samples collected from the monitoring well network were analyzed for VOCs only. During October 2004, all monitoring network samples collected were analyzed for VOCs. Additionally, the samples collected from the newly installed upgradient wells were analyzed for the general geochemistry parameters and the non-target compounds listed above.

The results of the general chemistry analyses are presented in Tables 5-9 and 5-10 and the dissolved gases results are presented in Table 5-7. The general chemistry parameters show that there are some significant differences in groundwater geochemistry between the shallow and the deep zones of the alluvial aquifer. The most notable difference is for dissolved oxygen (DO). In an uncontaminated aquifer, dissolved oxygen concentrations are typically higher in the shallow water table zone, and lower in the deeper zone of a confined aquifer. However, results for the site are just the reverse, with DO concentrations nearly an order of magnitude lower in the shallow zone (with the exception of the SK-3S/D well pair). A similar trend is noted for nitrate, sulfate, and ORP. Iron and manganese have the opposite trend, with the higher concentrations found in the shallow wells. Total iron concentrations are generally two orders of magnitude higher in the shallow wells.

These results indicate that biogenic activities, potentially associated with groundwater contamination, have taken place in the shallow zone that have resulted in depletion of electron acceptors, particularly DO. When DO is consumed, anaerobic microorganisms typically use additional electron acceptors (as available) in the following order of preference: nitrate, ferric iron, sulfate, and finally carbon dioxide. The relative depletion of nitrate and sulfate noted in some of the shallow wells, compared to the deeper, supports this mechanism. As the shallow groundwater become more reducing, iron and manganese become more soluble, and their concentrations increase in the shallow zone.

M-5A GeoProbe® Groundwater Chemistry

Groundwater samples were collected directly from GeoProbe® sampling equipment throughout the three phases of the RFI. Overall, the groundwater grab samples confirmed the findings of the monitoring well sample results. The samples detected concentrations of TCE, PCE, TCA, DCA, DCE, cis-1,2-DCE, chloroform, CCl_4, xylenes, toluene, trans-1,2-DCE, benzene, and ethylbenzene. Primarily, the groundwater grab samples confirm the monitoring well detections and relatively low levels of dissolved chlorinated hydrocarbons occur in the groundwater across most of the site. The occurrence of the aromatic hydrocarbons was more limited in area and extent.

The groundwater quality assessed by the direct push grab samples was not equivalent quantitatively with the groundwater quality assessed by the subsequently-installed monitoring wells. Concentrations of specific constituents were often higher in the grab sample. This is most likely due to the occurrence of some vertical stratification of contaminants in the aquifer near source areas and the difference in the depth and sampling interval for groundwater samples obtained from monitoring wells vs. Geoprobe borings. Contaminants in groundwater originating from a nearby surface source typically exhibit higher concentrations at the water table and diminish in concentration at depth with mixing in the aquifer. Additionally, groundwater samples collected from Geoprobe borings are collected without well development and as a result typically have high turbidity. In view of these factors, the analytical results for groundwater samples obtained at a given location (whether from samples collected at monitoring wells or Geoprobe borings) will vary depending on both the depth and length of the sampling interval within the saturated zone from which the samples were obtained. Both monitoring well and Geoprobe data have been used to assess the extent and chemical character of dissolved impacts in the alluvial aquifer, recognizing that differences and/or limitations in the two different types of data may be present.

M-6 Summary

M-6A Hydrogeology

- The unconsolidated sediments below the site consist of gravelly clay with silt to approximately 7 to 17 feet, underlain by a sand unit, approximately 9 to 17 feet thick. A 2 to 4 foot clay layer is then encountered across most of the site, with the exception of the southwestern corner. Another 8 to 9 feet of sand underlie the clay. These unconsolidated sediments are underlain by the Wellington Shale.

- The depth to groundwater is generally less than 15 feet bgs in the site vicinity. The alluvial aquifer is separated into an upper and lower zone by a 2 to 4 thick clay layer across most of the site. The upper zone is under water table conditions and is approximately 10 to 12 feet thick. This clay layer pinches out in the southwestern portion of the site. Groundwater occurs under semi-confined conditions in the lower zone over most of the site.

- The direction of groundwater flow is to the south/southeast across the site in both the upper and lower zone. Groundwater flows toward the East Fork of Chisholm Creek located approximately 150 feet east of the site. The estimated groundwater seepage velocity is 400 to 1,300 feet per year.

- A slight upward vertical gradient exists in the deeper zone in the vicinity of well pairs SK-1S/1D, SK-2S/2D, and SK-5S/5D at the site. Due to the presence of the clay layer and the upward vertical gradient in the vicinity of these well pairs, , the downward migration of dissolved constituents from the upper zone to the lower zone on the site may be impeded.

M-6B Groundwater Quality

- Groundwater migrating on site from upgradient sources includes concentrations of chlorinated hydrocarbon compounds and aromatic hydrocarbon compounds. The highest concentrations of chlorinated hydrocarbon compounds observed in historical and recent sampling includes TCE (up to 110 μg/L), cis-1,2-DCE (up to 200 μg/L), chloroform (up to 44 μg/L), and carbon tetrachloride (up to 17 μg/L). Other hydrocarbons include napthalene, n-propylbenzene, sec-butylbenzene, n-butylbenzene, and 1,2,4-trimethylbenzene.These concentrations were in shallow wells.

- Impacts to the groundwater at the site as a result of historical operations on the facility appear to be largely limited to the upper zone of the alluvial aquifer. The vertical migration of constituents from the upper zone to the lower zone is impeded by a clay layer that occurs over much of the site, and by a slight upward vertical gradient. The only constituents detected in the deep zone in the most recent sampling are constituents observed in the deep zone at upgradient wells, cis-1,2 DCE and TCE, with the exception of VC detected in October 2003 in SK-4D.

- A chlorinated hydrocarbon signature is present in groundwater from each of the wells installed in the upper zone across the site. All shallow wells show at least low levels (in the range of 5 to 100 μg/L) of PCE, TCE, and cis-1,2 DCE. Based on characterization of upgradient groundwater quality, it appears that the widespread occurrence of TCE and cis-1,2 DCE is at least in part explained by the occurrence of these constituents in upgradient groundwater quality. The occurrence of PCE appears largely attributable to site impacts.

- Twelve VOC constituents identified in the upper zone of the site groundwater exceeded the Region 9 PRGs or MCLs in at least one of the six groundwater sampling events conducted during the RFI. These constituents include the following: 1,1,1-TCA, 1,1-DCE, 1,2,4-TMB, 1,3,5-TMB, bromodichloromethane, carbon tetrachloride, chloroform, cis-1,2-DCE, naphthalene, PCE, TCE, and VC. It should be noted that concentrations of naphthalene on site do not exceed the concentrations observed upgradient of the facility. In addition, the carbon tetrachloride and chloroform, a degradation product, occur at concentrations similar to, but slightly less than that observed in shallow upgradient well WND-32S, and these constituents are considered to originate from upgradient sources.

- The area of greatest impact to groundwater is the area downgradient of the Process Area Storage Tanks and the Elevated Storage Tank Area in Building D (SWMUs #1 and 7). Groundwater impacts in this area consist predominantly of cis-1,2 DCE and PCE at concentrations up to 1,500 and 1,100 µg/L. The area is defined by monitoring well data at SK-2S, SK-5S, SK-B68. Concentrations of PCE, TCE, and cis-1,2 DCE each occur at values greater than the MCLs of 5, 5, and 70 µg/L, respectively. Groundwater quality impacts are observed to the west and east of the Process Area and Building D, but at lower levels.

- Groundwater quality impacts occur in the vicinity of the Former Buried Paint Can Pit (SWMU #20). The constituents include a variety of substituted aromatic compounds that are consistent with a paint related source and are likely associated with the historic manufacturing of paint at the facility when it was owned by the Enmar Paint Company.

- The impacts to groundwater associated with the facility migrate southeast, toward Chisholm Creek. The concentrations decline significantly toward the creek but occur in nearby offsite monitoring well SK-10S at values above the MCLs for PCE, TCE cis-1,2 DCE and VC. The creek is expected to be a hydraulic barrier to groundwater migration further to the east.

- Anaerobic biodegradation of constituents in soil and groundwater is occurring at the site but is limited by the low availability of electron donors.

Table 5-7
Groundwater Sample Analytical Results for Volatile Organic Compounds in Monitoring Wells in µg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	Benzene	Bromodichloromethane	Carbon tetrachloride	Chlorodibromomethane	Chloroform	cis-1,2-Dichloroethene	Ethane	Ethylbenzene	Isopropylbenzene	m-Xylene & p-Xylene	Methane	Methylene chloride	n-Butylbenzene	n-Propylbenzene	Naphthalene	o-Xylene	p-Isopropyltoluene	sec-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl chloride
Maximum Contaminant Level (MCL)			200	*0.055*	*810*	7	NA	70	*12*	*12*	75	5	80	5	80	80	70	NA	700	*660*	10000	NA	*4.3*	*240*	*240*	*6.2*	10000	NA	*240*	5	1000	100	5	2
SK-7D	10/21/2004		<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	**45.0**	<0.500	<10.00	<10.00	<20.0	**1.60**	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	**200**	<10.00
	10/21/2004	DUP	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	**44.0**	<0.500	<10.00	<10.00	<20.0	**1.40**	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	**210**	<10.00
SK-8D	10/21/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**2.20**	<0.500	<1.00	<1.00	<2.00	**1.40**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**40.0**	<1.00
SK-8S	10/21/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**2.10**	<0.500	<1.00	<1.00	<2.00	**55.0**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**7.80**	<1.00
SK-9D	10/21/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**8.30**	<0.500	<1.00	<1.00	<2.00	**1.10**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**47.0**	<1.00
SK-B68	11/12/2001		**20.0**	<2.50	**2.70**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**89.0**	<0.500	<2.50	<2.50	<5.00	**700 D**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**5.90**	<2.50	<1.20	**6.30**	<2.50
	11/12/2001	DUP	**120**	<10.00	**18.0**	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	**370**	<0.500	<10.00	<10.00	<20.0	**740 D**	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	**26.0**	<10.00	<5.00	**40.0**	<10.00
	8/26/2002		**110**	<2.50	**6.70**	**7.40**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**83.0**	<0.500	<2.50	<2.50	<5.00	**580 D**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**32.0**	<2.50	<1.20	**29.0**	<2.50
	10/22/2003		**20.0**	<1.00	**1.20**	**1.10**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**25.0**	—	<1.00	<1.00	<2.00	—	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**15.0**	<1.00	<0.500	**12.0**	<1.00
	10/19/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**14.0**	—	<1.00	<1.00	<2.00	—	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**1.60**	<1.00
SK-B92	8/26/2002		**4.30**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**31.0**	<2.50	**30.0**	**5.40**	—	<2.50	<2.50	<5.00	—	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**100**	<2.50	<1.20	**37.0**	<2.50
	8/26/2002	DUP	**4.10**	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**30.0**	<2.50	**37.0**	**5.20**	—	<2.50	<2.50	<5.00	—	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**94.0**	<2.50	<1.20	**35.0**	<2.50
	10/22/2003		**15.0**	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**6.70**	—	<2.00	<2.00	<4.00	—	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**100**	<2.00	<1.00	**6.90**	<2.00
	10/22/2003	DUP	**17.0**	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**7.00**	—	<2.00	<2.00	<4.00	—	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**120**	<2.00	<1.00	**7.40**	<2.00
	10/19/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**2.50**	—	<1.00	<1.00	<2.00	—	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**27.0**	<1.00	<0.500	**11.0**	<1.00
SK-OW1	8/26/2002		<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**18.0**	—	<2.50	<2.50	<5.00	—	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<1.20	**110**	<2.50
WND-32D	11/13/2001		<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**17.0**	—	<2.00	<2.00	<4.00	—	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.00	**110**	<2.00
	8/26/2002		<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	**13.0**	—	<2.50	<2.50	<5.00	—	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<1.20	**78.0**	<2.50
	8/26/2002	DUP	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	**13.0**	—	<2.00	<2.00	<4.00	—	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.00	**79.0**	<2.00
	10/21/2003		<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	**18.0**	—	<3.30	<3.30	<6.70	—	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<1.70	**110**	<3.30
	10/19/2004		<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	**15.0**	—	<2.70	<2.70	<5.30	—	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<1.30	**72.0**	<2.70
WND-32S	4/25/2001		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**17.0**	<1.00	**44.0**	**1.30**	—	<1.00	<1.00	<2.00	—	**1.20**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**13.0**	<1.00
	11/11/2001		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**6.40**	<1.00	**32.0**	**1.10**	—	<1.00	<1.00	<2.00	—	**1.00**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**11.0**	<1.00
	8/25/2002		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**2.50**	**1.00**	—	<1.00	<1.00	<2.00	—	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	**12.0**	<1.00
	10/21/2003		<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	—	<2.70	<2.70	<5.30	—	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<1.30	<2.70	<2.70
	10/20/2004		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	—	<1.00	<1.00	<2.00	—	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.500	<1.00	<1.00

µg/L micrograms per liter
Detections are shown in bold
Detections that exceed the MCL are shaded
NA Not available
— Not Analyzed
If USEPA has not promulgated an MCL for a listed constituent, Region 9 PRG values for Tap Water were used. PRG values are *italicized*.
MCL values were obtained from EPA 822-R-04-005 Drinking Water Standards and Health Advisories table, Winter 2004
USEPA Region 9 PRG values were obtained from the table published in October 2004
Data Validation Qualifier of "U" indicates that the analyte was detected in the associated field blank.
Laboratory Data Qualifier of "D" indicates that the reported result was obtained from analysis of a dilution.

Table 5-9
Groundwater Analytical Results, General Chemistry, and Metals in mg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Total	Ammonia (as N)	Calcium (Dissolved)	Chloride	Iron (Dissolved)	Iron (Total)	Magnesium (Dissolved)	Manganese (Dissolved)	Manganese (Total)	Nitrogen, Nitrate	Nitrogen, Nitrite and Nitrate	Potassium (Dissolved)	Sodium (dissolved)	Sulfate	Total Dissolved Solids	Total Organic Carbon
HRI-03	4/25/2001		298	<5.00	298	<0.100	123	60.7	0.250	4.60	45.4	0.047	1.00	2.60	--	<3.00	--	229	781	3.90
	11/11/2001		338	<5.00	338	<0.100	133	73.0	<0.100	0.330	52.3	0.280	0.340	--	2.20	<3.00	50.5	215	798	2.60
	8/25/2002		290	<5.00	290	<0.100	87.0	7.20	<0.100	0.350	25.0	0.051	0.450	--	0.510	<3.00	21.0	41.0	390	4.50
MW-10	4/25/2001		450	<5.00	450	0.300	98.8	53.3	1.20	188	27.1	1.10	3.80	--	--	<3.00	--	10.3	592	14.6
	11/11/2001		448	<5.00	448	0.300	94.8	39.9	2.20	391	26.3	1.20	7.10	--	--	3.30	--	<5.00	940	3.50
	8/25/2002		430	<5.00	430	0.270	92.0	47.0	2.40	43.0	24.0	0.93	1.40	--	--	3.60	--	6.40	530	4.30
MW-11	4/25/2001		116	<5.00	116	0.130	287	6.70	<0.100	152	19.1	<0.010	1.40	--	--	3.00	--	741	313	10.9
	11/11/2001		257	<5.00	257	0.130	135	10.2	1.70	93.0	17.1	0.860	1.40	--	--	3.20	--	203	595	3.60
	11/11/2001	DUP	263	<5.00	263	0.150	132	12.1	1.90	77.6	16.7	0.780	1.40	--	--	3.40	--	164	655	3.50
	8/25/2002		98.0	<5.00	98.0	<0.100	190	3.50	<0.100	21.0	14.0	<0.010	0.170	--	--	3.20	--	430	770	1.70
MW-14	4/25/2001		459	<5.00	459	0.390	119	51.1	6.80	285	31.1	2.80	5.70	--	--	<3.00	--	29.0	488	12.9
	11/11/2001		496	<5.00	496	0.370	136	43.4	8.40	396	36.1	3.10	6.20	--	--	3.00	--	40.7	540	4.50
	8/25/2002		360	<5.00	360	0.360	120	8.80	8.30	37.0	18.0	2.10	2.40	--	--	<3.00	--	57.0	490	5.80
RSC-1	4/25/2001		328	<5.00	328	<0.100	135	77.9	<0.100	12.8	53.2	0.180	0.93	--	--	3.50	--	228	862	2.00
	11/11/2001		337	<5.00	337	<0.100	143	79.1	<0.100	4.20	57.1	0.160	0.500	--	--	<3.00	--	231	858	1.90
	8/25/2002		330	<5.00	330	<0.100	140	81.0	<0.100	2.70	55.0	0.180	0.790	--	--	<3.00	--	250	840	2.10
SK-10S	11/11/2001		338	<5.00	338	0.390	92.8	80.5	<0.100	259	41.3	2.60	9.80	--	--	3.00	--	142	680	4.60
	11/11/2001	DUP	332	<5.00	332	0.440	94.8	80.2	<0.100	430	42.1	2.70	12.2	--	--	3.40	--	160	840	5.40
	8/25/2002		350	<5.00	350	0.310	94.0	83.0	<0.100	140	42.0	2.70	6.40	--	--	3.10	--	120	970	3.40

Table 5-9
Groundwater Analytical Results, General Chemistry, and Metals in mg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Total	Ammonia (as N)	Calcium (Dissolved)	Chloride	Iron (Dissolved)	Iron (Total)	Magnesium (Dissolved)	Manganese (Dissolved)	Manganese (Total)	Nitrogen, Nitrate	Nitrogen, Nitrite and Nitrate	Potassium (Dissolved)	Sodium (dissolved)	Sulfate	Total Dissolved Solids	Total Organic Carbon
SK-11S	11/11/2001		351	<5.00	351	<0.100	66.0	61.2	<0.100	0.200	21.6	0.750	0.650	--	--	<3.00	--	193	704	5.00
	8/25/2002		330	<5.00	330	<0.100	85.0	62.0	<0.100	37.0	30.0	0.720	3.90	--	--	<3.00	--	180	760	2.60
SK-1D	10/26/2000		238	<5.00	238	--	108	84.5	<0.100	1.50	42.8	0.610	0.580	--	--	10.1	--	296	906	2.20
	4/24/2001		274	<5.00	274	<0.100	160	53.3	<0.100	0.640	62.8	0.057	0.073	--	--	3.10	--	391	944	1.20
	11/11/2001		269	<5.00	269	<0.100	164	50.6	<0.100	0.350	62.9	0.056	0.069	--	--	<3.00	--	443	1000	3.50
	11/11/2001	DUP	270	<5.00	270	<0.100	163	50.9	<0.100	0.460	63.9	0.055	0.067	--	--	<3.00	--	419	994	4.00
	8/25/2002		270	<5.00	270	<0.100	160	50.0	<0.100	0.290	64.0	0.055	0.059	--	--	<3.00	--	440	1000	1.10
SK-1S	10/26/2000		252	<5.00	252	--	116	58.8	<0.100	88.2	42.2	0.074	1.10	--	--	<3.00	--	244	934	1.20
	4/24/2001		289	<5.00	289	<0.100	116	69.0	<0.100	81.4	45.5	0.880	1.70	--	--	<3.00	--	261	1230	1.80
	11/11/2001		260	<5.00	260	<0.100	131	55.5	<0.100	56.6	50.0	0.020	0.540	--	--	<3.00	--	315	1040	1.90
	8/25/2002		270	<5.00	270	<0.100	140	56.0	<0.100	9.10	55.0	0.024	0.100	--	--	<3.00	--	320	900	1.30
	8/25/2002	DUP	270	<5.00	270	<0.100	140	57.0	<0.100	22.0	53.0	0.023	0.270	--	--	<3.00	--	310	870	1.20
SK-2D	10/26/2000		325	<5.00	325	--	141	65.8	<0.100	0.840	54.5	1.60	1.50	--	--	4.40	--	268	927	2.20
	10/26/2000	DUP	--	--	--	--	143	--	<0.100	0.840	55.3	1.60	1.50	--	--	4.50	--			
	4/24/2001		321	<5.00	321	<0.100	146	65.0	<0.100	4.70	58.3	0.650	0.800	--	--	<3.00	--	316	972	1.10
	11/11/2001		347	<5.00	347	<0.100	141	56.0	<0.100	3.30	56.8	0.610	0.870	--	--	<3.00	--	287	895	16.9
	8/25/2002		280	<5.00	280	<0.100	120	51.0	<0.100	0.150	47.0	0.530	0.610	--	--	<3.00	--	220	730	<1.00
SK-2S	10/26/2000		445	<5.00	445	--	135	122	<0.100	22.7	36.9	3.10	3.50	--	--	4.00	--	76.0	878	3.10
	4/24/2001		428	<5.00	428	0.110	145	109	<0.100	216	36.9	3.00	7.30	--	--	3.50	--	138	1090	3.30
	11/11/2001		423	<5.00	423	0.130	134	80.8	0.130	385	35.7	2.50	10.5	--	--	3.30	--	132	825	5.20
	8/25/2002		440	<5.00	440	0.120	120	56.0	0.170	29.0	33.0	2.00	3.50	--	--	3.10	--	78.0	620	2.10

Table 5-9
Groundwater Analytical Results, General Chemistry, and Metals in mg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Total	Ammonia (as N)	Calcium (Dissolved)	Chloride	Iron (Dissolved)	Iron (Total)	Magnesium (Dissolved)	Manganese (Dissolved)	Manganese (Total)	Nitrogen, Nitrate	Nitrogen, Nitrite and Nitrate	Potassium (Dissolved)	Sodium (dissolved)	Sulfate	Total Dissolved Solids	Total Organic Carbon
SK-3D	10/26/2000		75.0	27.9	103	--	65.5	111	<0.100	0.600	15.9	0.110	0.025	--	--	7.60	--	142	510	3.60
	4/24/2001		265	<5.00	265	<0.100	109	53.0	<0.100	8.70	41.2	0.360	0.520	--	--	<3.00	--	195	736	1.30
	4/25/2001	DUP	275	<5.00	275	<0.100	103	53.4	<0.100	7.10	39.0	0.340	0.490	--	--	<3.00	--	174	738	1.40
	11/11/2001		285	<5.00	285	<0.100	106	52.0	<0.100	11.3	40.5	0.330	0.550	--	--	<3.00	--	189	649	20.0
	8/25/2002		250	<5.00	250	<0.100	94.0	44.0	<0.100	0.520	36.0	0.300	0.260	--	--	<3.00	--	150	580	1.40
SK-3S	10/26/2000		353	<5.00	353	--	128	98.0	<0.100	10.1	34.2	2.00	2.70	--	--	6.40	--	163	810	2.50
	4/24/2001		308	<5.00	308	0.120	110	61.5	1.40	181	39.3	1.00	2.50	--	--	3.90	--	183	829	3.90
	11/11/2001		282	<5.00	282	<0.100	102	53.4	<0.100	21.5	35.8	0.94	1.10	--	--	3.30	--	167	1000	5.90
	11/11/2001	DUP	277	<5.00	277	<0.100	102	57.8	<0.100	11.6	35.8	0.94	1.00	--	--	3.90	--	138	666	2.80
	8/25/2002		270	<5.00	270	<0.100	100	53.0	<0.100	14.0	34.0	0.880	0.95	--	--	3.70	--	140	640	2.10
	8/25/2002	DUP	270	<5.00	270	<0.100	100	54.0	<0.100	6.80	34.0	0.880	0.92	--	--	3.60	--	140	750	2.00
SK-4D	11/11/2001		338	<5.00	338	<0.100	120	65.1	<0.100	0.500	45.7	1.40	1.50	--	--	3.00	--	190	767	4.20
	8/25/2002		330	<5.00	330	<0.100	120	55.0	<0.100	0.700	45.0	1.10	1.10	--	--	3.20	--	180	690	2.00
SK-4S	10/27/2000		360	<5.00	360	--	128	48.4	2.20	212	38.3	3.20	6.00	--	--	3.30	--	143	540	4.20
	4/25/2001		383	<5.00	383	<0.100	144	32.0	<0.100	435	37.5	1.90	5.90	--	--	<3.00	--	172	1040	5.90
	4/25/2001	DUP	386	<5.00	386	0.100	143	32.3	<0.100	495	39.2	1.90	6.90	--	--	<3.00	--	200	970	4.00
	11/11/2001		386	<5.00	386	<0.100	138	36.9	<0.100	0.850	38.3	1.80	1.90	--	--	3.30	--	190	1030	2.90
	8/25/2002		360	<5.00	360	<0.100	130	29.0	<0.100	39.0	33.0	1.10	3.10	--	--	3.20	--	140	660	2.00
SK-5D	10/26/2000		178	<5.00	178	--	70.1	78.7	<0.100	2.10	25.0	0.590	0.730	--	--	5.50	--	121	586	2.50
	4/24/2001		299	<5.00	299	<0.100	122	54.8	<0.100	1.30	49.1	0.580	0.510	--	--	<3.00	--	228	878	1.40
	11/11/2001		318	<5.00	318	<0.100	119	74.4	<0.100	1.80	49.0	0.420	0.510	--	--	<3.00	--	234	770	18.9
	8/25/2002		340	<5.00	340	<0.100	140	61.0	<0.100	0.300	58.0	0.480	0.460	--	--	<3.00	--	250	830	1.40

Table 5-9
Groundwater Analytical Results, General Chemistry, and Metals in mg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Total	Ammonia (as N)	Calcium (Dissolved)	Chloride	Iron (Dissolved)	Iron (Total)	Magnesium (Dissolved)	Manganese (Dissolved)	Manganese (Total)	Nitrogen, Nitrate	Nitrogen, Nitrite and Nitrate	Potassium (Dissolved)	Sodium (dissolved)	Sulfate	Total Dissolved Solids	Total Organic Carbon
SK-5S	10/26/2000		274	<5.00	274	--	102	50.5	<0.100	123	37.0	0.98	2.10	--	--	3.40	--	153	796	2.30
	4/24/2001		500	<5.00	500	0.180	136	136	1.20	48.9	37.4	2.70	3.90	--	--	4.20	--	33.5	928	2.90
	11/11/2001		481	<5.00	481	0.240	128	115	2.60	35.6	35.5	2.60	3.50	--	--	3.90	--	68.0	910	4.60
	8/25/2002		480	<5.00	480	0.160	120	76.0	2.10	31.0	31.0	2.10	2.80	--	--	3.50	--	18.0	650	2.10
SK-6S	10/26/2000		396	<5.00	396	--	110	117	<0.100	121	41.7	2.80	5.20	--	--	3.40	--	105	850	3.30
	4/24/2001		445	<5.00	445	<0.100	118	77.4	<0.100	123	43.9	3.00	6.20	--	--	3.10	--	107	1020	2.70
	11/11/2001		410	<5.00	410	<0.100	99.8	56.1	<0.100	6.90	36.3	2.70	2.80	--	--	<3.00	--	93.2	1400	2.90
	8/25/2002		440	<5.00	440	<0.100	120	57.0	<0.100	57.0	44.0	3.40	6.20	--	--	3.00	--	140	760	2.30
SK-7D	10/21/2004		320	<5.00	320	<0.100	130	58.0	<0.100	14.0	54.0	0.290	0.540	--	--	3.00	--	260	920	1.40
	10/21/2004	DUP	320	<5.00	320	<0.100	130	57.0	<0.100	12.0	54.0	0.290	0.500	--	--	3.00	--	280	910	1.30
SK-8D	10/21/2004		330	<5.00	330	<0.100	140	63.0	<0.100	31.0	55.0	0.170	0.870	--	--	<3.00	--	250	880	1.60
SK-8S	10/21/2004		310	<5.00	310	0.180	100	36.0	<0.100	50.0	29.0	2.20	2.90	--	--	3.20	--	170	670	2.50
SK-9D	10/21/2004		270	<5.00	270	<0.100	110	55.0	<0.100	21.0	38.0	0.91	1.30	--	--	3.40	--	180	750	1.30
SK-B68	11/12/2001		482	<5.00	482	0.270	127	65.6	0.840	14.2	36.4	1.10	1.20	--	--	3.10	--	42.8	658	2.60
	11/12/2001	DUP	485	<5.00	485	0.250	127	65.5	0.800	10.8	36.6	1.10	1.20	--	--	3.10	--	48.3	674	2.70
	8/26/2002		360	<5.00	360	<0.100	110	18.0	0.510	0.610	30.0	0.630	0.630	--	--	<3.00	--	79.0	540	2.30
SK-B92	8/26/2002		290	<5.00	290	<0.100	110	40.0	<0.100	0.100	29.0	1.40	1.40	--	--	10.00	--	130	620	2.20
	8/26/2002	DUP	290	<5.00	290	<0.100	100	40.0	<0.100	0.100	28.0	1.40	1.40	--	--	10.00	--	140	620	2.30
SK-OW1	8/26/2002		260	<5.00	260	<0.100	100	41.0	1.30	5.60	38.0	0.780	0.830	--	--	<3.00	--	190	640	<1.00
WND-32D	11/13/2001		324	<5.00	324	<0.100	136	80.1	<0.100	55.3	55.8	0.080	1.30	--	--	<3.00	--	231	1070	2.40
	8/26/2002		360	<5.00	360	<0.100	130	81.0	<0.100	<0.100	54.0	0.035	0.048	--	--	<3.00	--	230	850	1.90
	8/26/2002	DUP	330	<5.00	330	<0.100	130	81.0	<0.100	<0.100	56.0	0.030	0.045	--	--	<3.00	--	250	850	1.80

Table 5-9
Groundwater Analytical Results, General Chemistry, and Metals in mg/L
Clean Harbors Kansas, LLC

Location	Date	Sample Type	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Total	Ammonia (as N)	Calcium (Dissolved)	Chloride	Iron (Dissolved)	Iron (Total)	Magnesium (Dissolved)	Manganese (Dissolved)	Manganese (Total)	Nitrogen, Nitrate	Nitrogen, Nitrite and Nitrate	Potassium (Dissolved)	Sodium (dissolved)	Sulfate	Total Dissolved Solids	Total Organic Carbon
WND-32S	4/25/2001		**321**	<5.00	**321**	**0.220**	**124**	**108**	<0.100	**51.8**	**31.8**	**2.00**	**4.90**	--	--	**5.10**	--	**164**	**693**	**7.40**
	11/11/2001		**310**	<5.00	**310**	<0.100	**124**	**68.7**	<0.100	**42.4**	**30.6**	**3.30**	**1.40**	--	**6.30**	**5.60**	**78.8**	**138**	**925**	**2.50**
	8/25/2002		**290**	<5.00	**290**	<0.100	**110**	**81.0**	<0.100	**3.70**	**28.0**	**0.240**	**0.320**	--	**8.40**	**6.50**	**74.0**	**100**	**650**	**2.40**
FIELD BLANK	8/25/2002	BLANK	<5.00	<5.00	<5.00	<0.100	<0.200	<2.50	<0.100	<0.100	<0.200	<0.010	<0.010	--	<0.100	<3.00	<5.00	<5.00	<10.00	<1.00
EQUIPMENT BLANK	10/27/2000	BLANK	--	--	--	--	<0.200	--	<0.100	<0.100	<0.200	<0.010	<0.010	--	--	<3.00	--	--	--	--
	4/25/2001	BLANK	--	--	--	--	<0.200	--	<0.100	--	<0.200	<0.010	--	--	--	<3.00	--	--	--	--
	8/25/2002	BLANK	6.40	<5.00	6.40	<0.100	<0.200	<2.50	<0.100	<0.100	<0.200	<0.010	<0.010	--	<0.100	<3.00	<5.00	<5.00	<10.00	<1.00

Detections are in **bold**.
mg/L - milligrams per liter
-- No data available

Table 5-10
Groundwater Field Parameters
Clean Harbors Kansas, LLC

Location	Date	Conductivity #1	Conductivity #2	Conductivity #3	Conductivity #4	Conductivity #5	Dissolved Oxygen #1 (%)	Dissolved Oxygen #1 (ppm)	Dissolved Oxygen #2 (ppm)	Dissolved Oxygen #3 (ppm)	Dissolved Oxygen #4 (ppm)	Dissolved Oxygen #5 (ppm)	Ferrous Iron	Gallons Purged #1	Gallons Purged #2	Gallons Purged #3	Gallons Purged #4	Gallons Purged #5
HRI-03	11/10/01	1167	1183	1184	1178	--	--	3.89	3.01	3.4	3.33	--	--	10	20	30	40	--
	08/24/02	485	580	630	631	--	--	0.21	--	--	--	--	--	--	--	--	--	--
	10/22/03	808	818	820	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	1182	1182	1177	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-10	11/11/01	894	909	906	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	576	621	655	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	580	488	492	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	961	965	962	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-11	11/11/01	1223	954	896	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	737	729	742	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	723	1375	1377	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	1077	1071	1089	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-14	11/11/01	1114	1100	1097	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	577	583	583	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	791	784	815	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	1105	1103	1102	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-15	10/21/03	527	493	530	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/19/04	890	889	889	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-18	10/21/03	935	907	952	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/19/04	916	919	921	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RSC-1	11/10/01	1237	1225	1226	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	905	779	888	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	788	670	658	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	1338	1347	1346	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SK-1D	11/10/01	1327	1346	1337	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	955	954	994	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	1406	1395	1392	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/19/04	1344	1341	1341	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SK-1S	11/10/01	1180	1102	1134	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	881	877	872	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/03	1195	1022	968	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/19/04	1191	1129	1140	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SK-2D	11/10/01	1254	1253	1248	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/02	794	794	789	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/22/03	1079	1140	1138	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/20/04	1330	1330	13240	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Location	Date	pH #1	pH #2	pH #3	pH #4	pH #5	PID	Redox Potential #1	Redox Potential #2	Redox Potential #3	Redox Potential #4	Redox Potential #5	Temperature #1	Temperature #2	Temperature #3	Temperature #4	Temperature #5	Turbidity #1	Turbidity #2	Turbidity #3	Turbidity #4	Turbidity #5
HRI-03	11/10/01	6.73	6.9	6.94	6.95	--	--	297	276	254	253	--	17.4	17.3	17.2	17	--	124	895	1000 [3]	1000 [3]	--
	08/24/02	7.1	7.14	7.03	6.98	6.97	0	252	261.7	271.9	278.4	282.2	17.43	18.52	17.59	17.42	17.45	NM [2]	81.1	206	262	208
	10/22/03	7.02	7.03	7.01	--	--	--	127.9	126.8	128	--	--	16.45	16.53	16.39	--	--	36.4	22	18.4	--	--
	10/20/04	6.1	6.18	6.24	--	--	--	413.1	405.9	400.1	--	--	16.51	16.6	16.61	--	--	12.95	23.73	30.36	--	--
MW-10	11/11/01	7.23	7.33	7.23	--	--	--	-150	-167	-161	--	--	17.8	17.8	17.9	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	7.16	7.26	7.31	--	--	--	104.3	-91.9	-110.9	--	--	17.86	18.45	17.92	--	--	NM [2]	649	1000 [3]	--	--
	10/21/03	7.08	7.12	7.11	--	--	--	-252.6	-265.7	-274.7	--	--	18.72	18.48	18.29	--	--	747	659	531	--	--
	10/20/04	6.92	6.95	6.95	--	--	--	-132.3	-153.4	-159.4	--	--	17.72	17.69	17.76	--	--	111	155	146	--	--
MW-11	11/11/01	7.3	6.82	6.85	--	--	--	107	44	20	--	--	19.3	18.7	18.6	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	6.73	6.29	6.24	--	--	--	93.2	146.3	165.1	--	--	17.79	19.26	18.7	--	--	NM [2]	217	378	--	--
	10/21/03	6.44	6.37	6.37	--	--	--	201.3	204.3	196.7	--	--	21.26	21.08	20.96	--	--	322	265	289	--	--
	10/20/04	6.79	6.79	6.69	--	--	--	19.6	11.4	27.9	--	--	18.84	18.86	18.92	--	--	241	240	326	--	--
MW-14	11/11/01	6.85	7	7.02	--	--	--	-70	-110	-123	--	--	18.8	18.8	18.8	--	--	52	1000 [3]	1000 [3]	--	--
	08/24/02	6.82	6.94	6.95	--	--	--	-67.3	-73.4	-72.5	--	--	18.7	18.84	18.83	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/21/03	6.83	6.94	6.95	--	--	--	-146.8	-147.1	-134.8	--	--	20.86	20.44	20.42	--	--	573	300	267	--	--
	10/20/04	6.72	6.69	6.67	--	--	--	86.1	43.9	32.1	--	--	18.97	19	18.96	--	--	245	243	265	--	--
MW-15	10/21/03	7.19	7.18	7.18	--	--	--	-115.7	-129.9	-122.3	--	--	18.96	18.35	18.57	--	--	Error [4]	Error [4]	Error [4]	--	--
	10/19/04	7.43	7.33	7.32	--	--	--	-16.4	-19.7	-19.6	--	--	18.18	18.19	18.05	--	--	505	499	359	--	--
MW-18	10/21/03	6.99	7	6.92	--	--	--	206.7	204.4	225.2	--	--	19.77	19.55	19.59	--	--	360	1000	1000	--	--
	10/19/04	7.34	7.26	7.18	--	--	--	47.1	50.6	59.2	--	--	18.89	18.98	19.03	--	--	197	344	307	--	--
RSC-1	11/10/01	7.23	7.26	7.17	--	--	--	252	223	264	--	--	16.8	16.9	17.1	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	6.78	7.15	7.12	--	--	--	374.7	334.9	342.9	--	--	17.35	18.31	18.17	--	--	NM [2]	629	334	--	--
	10/21/03	6.94	6.98	6.99	--	--	--	205.2	206.1	213.6	--	--	17.82	17.66	17.75	--	--	150	66.8	50.5	--	--
	10/20/04	6.68	6.73	6.69	--	--	--	315	316.4	315.1	--	--	17.02	16.93	17.1	--	--	55	73	46.53	--	--
SK-1D	11/10/01	7.07	7.21	7.27	--	--	--	261	252	255	--	--	16.9	16.7	16.5	--	--	42.5	88	150	--	--
	08/24/02	7.36	7.36	7.29	--	--	--	324.2	321.4	324.6	--	--	17.56	18.43	17.42	--	--	NM [2]	24.7	24.7	--	--
	10/21/03	7.34	7.28	7.19	--	--	--	165	167.5	171.2	--	--	17.19	17.45	17.39	--	--	16.5	15.3	15	--	--
	10/19/04	7.34	7.27	7.25	--	--	--	58.6	57.9	56.2	--	--	17.31	17.13	17.16	--	--	17.69	11.94	5.36	--	--
SK-1S	11/10/01	7.48	7.11	7.01	--	--	--	222	239	236	--	--	16.2	17.1	17.5	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	7.05	7.12	7.13	--	--	--	320	317.8	319.7	--	--	16.89	17.91	17.84	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/21/03	6.82	6.88	6.89	--	--	--	141.2	132.3	122.1	--	--	17.95	17.93	17.97	--	--	726	725	598	--	--
	10/19/04	7.35	7.27	7.24	--	--	--	85.6	77.2	61.2	--	--	17.83	17.79	17.86	--	--	104	106	93	--	--
SK-2D	11/10/01	7.37	7.29	7.24	--	--	--	207	210	215	--	--	18.7	17.4	17.4	--	--	190	122	71	--	--
	08/24/02	7.01	6.96	6.99	--	--	--	303.9	309.8	312.9	--	--	17.54	18.26	17.9	--	--	NM [2]	19.6	28	--	--
	10/22/03	6.78	6.78	6.82	--	--	--	145.5	144.9	138.8	--	--	16.74	17.13	17.09	--	--	8.34	7.76	7.39	--	--
	10/20/04	6.73	6.73	6.72	--	--	--	312.1	331.2	339.6	--	--	17.22	17.2	17.19	--	--	27.35	4.57	0	--	--

Table 5-10
Groundwater Field Parameters
Clean Harbors Kansas, LLC

Location	Date	Conductivity #1	Conductivity #2	Conductivity #3	Conductivity #4	Conductivity #5	Dissolved Oxygen #1 (%)	Dissolved Oxygen #1 (ppm)	Dissolved Oxygen #2 (ppm)	Dissolved Oxygen #3 (ppm)	Dissolved Oxygen #4 (ppm)	Dissolved Oxygen #5 (ppm)	Ferrous Iron	Gallons Purged #1	Gallons Purged #2	Gallons Purged #3	Gallons Purged #4	Gallons Purged #5	pH #1	pH #2	pH #3	pH #4	pH #5	PID	Redox Potential #1	Redox Potential #2	Redox Potential #3	Redox Potential #4	Redox Potential #5	Temperature #1	Temperature #2	Temperature #3	Temperature #4	Temperature #5	Turbidity #1	Turbidity #2	Turbidity #3	Turbidity #4	Turbidity #5
SK-2S	11/10/01	1193	1209	1198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.07	7.18	7.21	--	--	--	229	134	137	--	--	19	18.3	17.5	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	796	777	767	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.22	7.17	7.1	--	--	--	30	135	146.5	--	--	17.18	18.04	17.85	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/22/03	1010	1052	1096	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.67	6.73	6.79	--	--	--	132.2	121.1	72.6	--	--	18.7	18.89	18.74	--	--	854	787	752	--	--
	10/20/04	1117	1110	1113	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.75	6.76	6.73	--	--	--	359.2	354.9	343.1	--	--	18.46	18.35	18.38	--	--	145	124	80	--	--
SK-3D	11/10/01	1027	1020	1018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.94	6.97	6.97	--	--	--	251	251	261	--	--	17.1	17	17.3	--	--	226	168	168	--	--
	08/24/02	682	686	684	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.95	7	7.01	--	--	--	245.2	261.8	263.7	--	--	16.99	17.82	17.73	--	--	NM [2]	33.9	45.8	--	--
	10/22/03	1282	1267	1189	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.93	6.84	6.8	--	--	--	133	133.1	130.5	--	--	17.23	17.19	17.15	--	--	12.4	8.55	7.08	--	--
	10/20/04	1135	1131	1134	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.87	6.86	6.85	--	--	--	284.5	299.8	308.9	--	--	16.95	17.04	16.96	--	--	19.25	9.07	6.94	--	--
SK-3S	11/10/01	927	971	975	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.89	6.88	6.89	--	--	--	238	230	236	--	--	18.1	18.3	18.1	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	972	704	702	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.93	6.94	6.89	--	--	--	115.2	165.7	175.5	--	--	16.9	17.95	17.7	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/22/03	1114	1119	1070	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.72	6.76	6.74	--	--	--	30.1	-31.4	-43	--	--	18.12	18.26	18.18	--	--	15.7	18.5	19	--	--
	10/20/04	1101	1104	1106	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.77	6.78	6.69	--	--	--	341.6	338.2	330.5	--	--	17.73	17.61	17.56	--	--	9.98	10.38	8.57	--	--
SK-4D	11/10/01	998	1088	1116	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.94	7.02	7.03	--	--	--	118	94	107	--	--	17.4	16.7	16.5	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	681	637	755	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.87	6.9	6.9	--	--	--	276.5	272.5	277.5	--	--	17.44	18.78	17.42	--	--	NM [2]	15.9	1000 [3]	--	--
	10/21/03	898	1085	1007	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.84	6.86	6.87	--	--	--	78.3	87.2	90.1	--	--	16.75	16.93	16.72	--	--	11.4	314	304	--	--
	10/20/04	1146	1148	1151	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.41	6.45	6.46	--	--	--	251.3	284.1	302.7	--	--	16.06	16.08	16	--	--	170	161	151	--	--
SK-4S	11/10/01	1074	1086	1089	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.27	7.09	7.11	--	--	--	206	223	221	--	--	17.6	17.5	17.4	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	763	695	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.97	6.95	6.9	--	--	--	284.8	292.3	294.9	--	--	16.19	17.64	17.27	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/21/03	764	797	800	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.99	6.85	6.79	--	--	--	27.8	7.8	6.2	--	--	17.66	17.35	17.39	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	10/20/04	953	954	954	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.57	6.6	6.58	--	--	--	323.4	316.2	326.2	--	--	16.77	16.65	16.6	--	--	618	695	676	--	--
SK-5D	11/10/01	1062	1113	1112	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.5	7.09	7.11	--	--	--	226	225	223	--	--	18.2	17.6	17.4	--	--	47.5	122	105	--	--
	08/24/02	829	825	831	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.14	7.33	7.27	--	--	--	256.2	270	273.8	--	--	18.01	18.98	18.67	--	--	NM [2]	13.7	15.4	--	--
	10/21/03	1095	1083	1077	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.13	6.95	6.93	--	--	--	2.9	6.1	14.6	--	--	17.61	17.9	18	--	--	56.4	27.4	11.4	--	--
	10/20/04	1184	1184	1174	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.83	6.82	6.78	--	--	--	304.6	310.9	317.2	--	--	16.98	16.94	17.01	--	--	12.41	8.85	10.53	--	--
SK-5S	11/10/01	1240	1204	1209	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.21	7.19	7.22	--	--	--	53	23	27	--	--	19	19	19	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	810	814	808	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.32	7.23	7.16	--	--	--	-83.4	-50.1	-27	--	--	18	18.4	18.76	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/21/03	661	839	1121	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.32	7.07	7.04	--	--	--	-99.3	-89.7	-89.2	--	--	19.44	19.5	19.46	--	--	631	801	1000 [3]	--	--
	10/20/04	1192	1184	1188	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.65	6.63	6.63	--	--	--	162.1	143.9	121.6	--	--	18.43	18.4	18.37	--	--	146	127	112	--	--
SK-6S	11/10/01	1369	1117	1115	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.25	7.28	7.22	--	--	--	246	232	240	--	--	15.5	16.3	16.4	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	08/24/02	879	887	882	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.87	7.12	7.1	--	--	--	329.1	328.3	333.4	--	--	16.48	17.49	17.35	--	--	NM [2]	1000 [3]	1000 [3]	--	--
	10/21/03	1037	1044	1044	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.8	6.92	6.96	--	--	--	203.2	198.7	197.2	--	--	16.49	16.6	16.58	--	--	1000 [3]	1000 [3]	1000 [3]	--	--
	10/20/04	972	981	999	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.45	7.25	7.17	--	--	--	106.9	113.5	121.4	--	--	16.71	16.75	16.68	--	--	265	655	511	--	--
SK-7D	10/21/04	1311	1313	1313	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.32	6.37	6.34	--	--	--	217.5	210.6	179.2	--	--	17.28	17.13	17.1	--	--	534	409	135	--	--
SK-8D	10/21/04	1362	1381	1379	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.93	6.85	6.83	--	--	--	346.1	360.7	364.3	--	--	17.25	17.25	17.24	--	--	1000 [3]	1000 [3]	341	--	--
SK-8S	10/21/04	1070	1059	1059	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.99	6.95	6.93	--	--	--	360.2	314.6	276.6	--	--	18.1	18.14	18.15	--	--	1000 [3]	895	734	--	--
SK-9D	10/21/04	1218	1217	1212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.84	6.79	6.79	--	--	--	362.4	352.6	348.9	--	--	17.62	17.65	17.76	--	--	202	418	502	--	--

Table 5-10
Groundwater Field Parameters
Clean Harbors Kansas, LLC

Location	Date	Conductivity #1	Conductivity #2	Conductivity #3	Conductivity #4	Conductivity #5	Dissolved Oxygen #1 (%)	Dissolved Oxygen #1 (ppm)	Dissolved Oxygen #2 (ppm)	Dissolved Oxygen #3 (ppm)	Dissolved Oxygen #4 (ppm)	Dissolved Oxygen #5 (ppm)	Ferrous Iron	Gallons Purged #1	Gallons Purged #2	Gallons Purged #3	Gallons Purged #4	Gallons Purged #5	pH #1	pH #2	pH #3	pH #4	pH #5	PID	Redox Potential #1	Redox Potential #2	Redox Potential #3	Redox Potential #4	Redox Potential #5	Temperature #1	Temperature #2	Temperature #3	Temperature #4	Temperature #5	Turbidity #1	Turbidity #2	Turbidity #3	Turbidity #4	Turbidity #5
SK-10S	11/19/01	1025	1076	1086	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.95	7.05	7	–	–	–	119	124	109	–	–	19	18.7	18.5	–	–	1000 [3]	1000 [3]	1000 [3]	–	–
	08/24/02	771	781	781	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.97	7.09	7.1	–	–	–	329.7	201.5	208.4	–	–	17.48	17.8	17.81	–	–	NM [2]	1000 [3]	1000 [3]	–	–
	10/21/03	1110	1109	1102	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.9	6.87	7.01	–	–	–	163	160.3	160.3	–	–	18.81	18.7	18.8	–	–	Error [4]	Error [4]	Error [4]	–	–
	10/19/04	1029	1018	1015	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.21	7.1	7.09	–	–	–	-10.1	-18.6	-20.5	–	–	18.6	18.51	18.52	–	–	215	412	230	–	–
SK-11S	11/19/01	1185	1143	1089	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.26	7.22	7.12	–	–	–	145	135	165	–	–	18	18.3	18.1	–	–	1000 [3]	1000 [3]	1000 [3]	–	–
	08/24/02	918	861	834	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.28	7.12	7.21	–	–	–	325.2	331	332.9	–	–	16.52	17.28	16.8	–	–	NM [2]	1000 [3]	1000 [3]	–	–
	10/21/03	1204	1156	1154	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.16	6.96	6.97	–	–	–	177.9	196.4	198.4	–	–	17.84	17.72	17.78	–	–	941	1000	1000	–	–
	10/19/04	1098	1099	1093	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.15	7.09	7.05	–	–	–	72	82.1	73.5	–	–	17.75	17.61	17.68	–	–	135	30.45	37.05	–	–
SK-B68	11/12/01	1145	1117	1145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.79	7.55	7.56	–	–	–	-147	-135	-133	–	–	17.7	17.9	18	–	–	1000 [3]	1000 [3]	1000 [3]	–	–
	08/26/02	620	618	617	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.9	6.95	7.05	–	–	–	253	192.5	119.2	–	–	18.53	17.91	17.91	–	–	3.66	1.5	0.61	–	–
	10/22/03	674	675	710	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.35	7.3	7.27	–	–	–	-31.2	-51.3	-60.2	–	–	18.77	18.67	18.65	–	–	18.5	56	24	–	–
	10/19/04	1124	1122	1110	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.62	6.78	6.85	–	–	–	204.8	197.5	195.6	–	–	17.45	17.84	17.59	–	–	95	62	42.99	–	–
SK-B92	08/26/02	688	686	683	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.06	6.99	6.97	–	–	–	254.2	248.4	237.5	–	–	18.53	18.37	18.29	–	–	22.2	8.62	5.17	–	–
	10/22/03	1042	1034	1070	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.77	6.84	6.78	–	–	–	100.2	98.7	103.3	–	–	18.78	18.63	18.67	–	–	188	98.9	53.4	–	–
	10/19/04	999	1011	1013	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.95	6.2	6.29	–	–	–	213	206.5	206.9	–	–	17.48	18.05	17.96	–	–	21.27	9.87	6.06	–	–
SK-OW1	08/26/02	682	693	704	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.03	7.07	7.1	–	–	–	37.5	-13.9	-22.3	–	–	19.24	18.97	19.07	–	–	173	91.8	49.7	–	–
WND-32D	11/12/01	1137	1256	1260	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.6	7.26	7.19	–	–	–	113	187	206	–	–	16.9	16.8	16.6	–	–	1000 [3]	1000 [3]	1000 [3]	–	–
	08/26/02	896	893	892	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.94	6.92	6.92	–	–	–	299.3	310.3	312.2	–	–	18.1	17.63	17.55	–	–	1.92	0.8	0.96	–	–
	10/22/03	1114	1121	1129	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.99	6.98	6.99	–	–	–	84.4	85.3	99	–	–	17.48	17.09	17.2	–	–	109	41.7	20.1	–	–
	10/19/04	980	977	981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.17	7.13	7.11	–	–	–	152	162	165.2	–	–	16.48	16.42	16.48	–	–	26.06	18.91	13.34	–	–
WND-32S	11/01/01	975	997	1047	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.86	6.85	6.88	–	–	–	138	129	132	–	–	17.9	17.7	17.6	–	–	22.3	176	158	–	–
	08/24/02	756	758	816	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.01	6.87	6.84	–	–	–	179.7	178.2	186.9	–	–	17.2	17.7	17.21	–	–	NM [2]	151	234	–	–
	10/21/03	1633	1533	1445	–	–	–	–	–	–	–	–	–	–	2	3	4	–	–	6.85	6.81	6.79	–	–	–	-102	-100.3	-98.1	–	–	18.64	18.29	18.3	–	–	125	53.2	53.9	–	–
	10/20/04	1547	1463	1465	–	–	–	0.38	–	–	–	–	–	–	1.5	2.5	3	–	–	6.6	6.56	6.57	–	–	–	261.3	226.3	198.2	–	–	17.45	17.35	17.38	–	–	49.49	41.44	37.36	–	–

NM [1] - No measurement - probe size too large for one-inch diameter wells

NM [2] - No measurement due to insufficient sample volume

1000 [3] - Measured value exceeded both the automatic and manual range of the instrument (Hach 2100P Portable Turbidimeter)

Error [4] - No measurement - the instrument produced an "E3" error indicating that the sample needed to be diluted

– No data available

Table of Contents

List of Attachments

N-1 Air Emission Standards for Process Vents

Per 40 CFR 264.1031, *Process vent* means any open-ended pipe or stack that is vented to the atmosphere either directly, through a vacuum-producing system, or through a tank (e.g., distillate receiver, condenser, bottoms receiver, surge control tank, separator tank, or hot well) associated with hazardous waste distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations.

Except for §264.1034, paragraphs (d) and (e), this subpart applies to process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations that manage hazardous wastes with organic concentrations of at least 10 ppmw.

N-1a Applicability

The Clean Harbors Kansas, LLC (CHK) facility stores hazardous waste and hazardous waste fuel. (For a more complete description of hazardous waste management activities at CHK, refer to Section B, Facility Description.) The hazardous waste management units at CHK will fulfill the subpart AA process vent requirements according to 40 CFR 264.1030 and 1031 and 270.14 once the tanks are activated. However, there are no regulated units currently operated at the CHK facility subject to the 40 CFR 264 Subpart AA process vent emissions standards.

N-2 Air Emissions Standards for Equipment Leaks

N-2a Applicability

The CHK facility stores hazardous waste and hazardous waste fuel. The waste lines and equipment are used at CHK to transfer hazardous waste liquids between or from waste storage tanks or from or to trucks for off site receipt or shipment. It is assumed, based on knowledge of process, that the hazardous waste liquids or gases handled in these lines at the facility potentially contact hazardous waste in excess of ten (10) percent total organic carbon (TOC) and are therefore subject to these standards. Appendix N-A, Facility and Process Drawings, contains diagrams of the pertinent equipment and piping in use at CHK.

A majority of the equipment at the CHK facility is potentially in ten (10) percent, or greater, TOC hazardous waste liquid or gas service except for water, air, or fire suppressant lines. These lines are identified separately from all other lines by their color or labelling.

N-2b Pumps in Light Liquid Service

All pumps at the CHK facility are assumed to be in light liquid service at some time due to the varied nature of the wastes managed at the facility. Because the exact composition of the waste stream varies, a heavy liquid service designation is difficult to sustain during actual operations. Therefore, all pumps at the facility are potentially subject to light liquid service standards and will be monitored monthly to detect leaks using the method specified in 264.1063 (b) unless exempted by a classification of no detectable emissions.

All pumps at the facility are subject to regular RCRA inspections, as described in Section F, Inspection Plan. These will occur at a minimum of once per week to locate indications of liquids dripping from pump seals. If there are indications that liquids are dripping from the pump seal (e.g., staining of surrounding substrate, visible liquids), a leak is considered to be detected. A leak is also be detected if the leak detection instrument measures 10,000 ppm or greater organics.

When a leak is detected, a first attempt at repair shall be made within five (5) calendar days and a permanent repair attempted within fifteen (15) calendar days of detection unless the standards of 264.1059 are met.

There are currently no pumps in operation at the CHK facility with a dual mechanical seal that includes a barrier fluid. When these types of pumps are installed, CHK will comply with the requirements of 40 CFR 264.1052 (d) if these pumps are to be exempted from monitoring requirements.

There are several pumps at the CHK facility which are eligible for the "no detectable emissions" exemption from 264.1052 (a), (b), and (d) with an instrument reading of 500 ppm or less above background. These pumps have no externally actuated shaft that penetrates the pump housing, and operate with no detectable emissions (i.e., less than 500 ppm measured by the method specified in 264.1063 (c)) and have been initially tested for compliance with this standard and will be tested annually for leaks above 500 ppm. Pumps which are eligible for the "no detectable emissions" exemption will be tested when requested by the Regional Administrator, as specified in 40 CFR 264.1052(e)(3).

N-2c Compressors

There are no compressor units subject to air emission standards at the CHK facility.

N-2d Pressure Relief Devices

There are no pressure relief devices installed on equipment subject to the 40 CFR Subpart BB regulations currently being operated in hazardous waste gas/vapor or liquid service at CHK.

N-2e Sampling Connection Systems

All sampling systems at the CHK facility are of the *in situ* type, are used in-line, and are not subject to subparagraphs (a) and (b) of 264.1055. These systems typically consist of a valve with an open ended line. This equipment is subject to the leak emissions standards and is included in the monitoring plan as required by 264.1056 or 264.1057. This system is operated in method consistent with the basis for the standards contained in 264.1055 (a) and (b) in that any purged waste prior to sampling is returned to the process.

N-2f <u>Open-ended Valves or Lines</u>

All open-ended valves and lines at the CHK facility are equipped with caps or plugs intended to seal the open end when the line or valve is not in service. All double block lines at the facility (i.e., lines with two valves) are operated such that the valve on the hazardous waste stream side is closed before the second valve is closed.

N-2g <u>Valves in Gas/Vapor Service or in Light Liquid Service</u>

All valves at the CHK facility are assumed to be in ten (10) percent or greater organic content light liquid gas/vapor service at some time due to the varied nature of the wastes managed at the facility. Because the exact composition of the waste streams varies, a heavy liquid service designation is difficult to sustain during actual operations. Therefore all valves at the facility are potentially subject to light liquid service requirements and will be treated as being in light liquid service for the purpose of complying with the air emission regulations. This designation assures that CHK complies with the requirements of 264.1063 (g).

Valves will be monitored monthly to detect leaks using the method specified in 264.1063 (b) unless exempted according to 264.1061 or according to 264.1057 (f), (g), or (h). If an instrument reading in excess of 10,000 ppm is measured during monitoring, a leak subject to the repair provisions of this program is detected.

When a leak is detected, a first attempt at repair shall be made within five (5) days and a permanent repair attempted within fifteen (15) calendar days of detection unless the standards of 264.1059 are met. First attempts at repair shall include tightening of bonnet bolts, replacement of bonnet bolts, tightening of packing gland nuts, and/or injection of lubricant into lubricated packings.

There are no valves in use at the CHK facility eligible for the no detectable emission exemption. Similarly, there are no valves designated as unsafe-to-monitor.

There are numerous valves designated as difficult-to-monitor pursuant to this paragraph on the existing units that were in operation prior to June 21, 1990. These valves have been determined to be difficult to monitor due to their location or elevation as specified in 264.1064 (h) (2). All valves currently designated as difficult-to-monitor are so designated in the log because of their location at or above two meters above a supported surface. Valves that have been identified as difficult-to-monitor are identified in the tables in Appendix N-D by the identification number P-XXXU/PXXXU or M-XXXU/MXXXU. These valves will be monitored according to this written plan for obtaining access to these valves for monitoring at a minimum of once per year.

N-2h <u>Pumps & Valves in Heavy Liquid Service; Flanges, and Other Connectors</u>

There are no pumps or valves designated in heavy liquid service at the CHK facility. Flanges and other connectors shall be monitored within five (5) calendar days by the method specified in 264.1063 (b) if evidence of a potential leak is found by visual, audible, olfactory, or other method. These potential leaks will normally be initially identified by observation of dripping or accumulated liquids or of stained substrate during scheduled inspections of the tank system and associated piping.

When a leak is detected, a first attempt at repair shall be made within five (5) calendar days and a permanent repair attempted within fifteen (15) calendar days of detection unless the standards of 264.1059 are met.

The practices specified in paragraph 264.1057 (e) shall constitute a first attempt at repair.

N-3 Delay of Repair

In the event that any repair of a connection, pump, or valve associated with a process unit must be delayed beyond fifteen (15) calendar days because it requires the shutdown of the hazardous waste management unit, that repair shall be completed during the next unit shutdown.

A delay of any other repair of a connection, pump, or valve will extend beyond the (15) days only if the equipment for which a leak has been detected can be isolated from the system and no longer contacts hazardous waste liquid or gas/vapor in concentrations exceeding ten (10) percent by weight.

N-3a Valves:

In delaying a repair of a valve beyond fifteen (15) calendar days, CHK will follow procedures as specified by 40 CFR 1059. CHK will determine whether or not the emissions from an immediate repair would exceed those likely to result from the procedures that would be used if repair could be delayed. Delay of repair will only occur when the emissions would be reduced by the delay, when the equipment is isolated from the hazardous waste management unit, or when the repair is technically infeasible without a hazardous waste management unit shutdown (in this case, the repair shall occur before the end of the next hazardous waste management unit shutdown). Delay of repair of a valve beyond the next hazardous waste management unit shutdown will only occur if valve assembly replacement is necessary during the shutdown, valve assembly supplies have been depleted, and valve assembly supplies had been sufficiently stocked before supplies were depleted. Delay of repair beyond the next hazardous waste management unit shutdown will only occur if the next hazardous waste management unit shutdown occurs sooner than six months after the first hazardous waste management unit shutdown.

CHK will comply with 40 CFR 264.1059 when repair of a valve is delayed. If delay of repair is performed in accordance with 40 CFR 264.1059(c)(2), the purged material collected during the repair will be destroyed or recovered in a control device complying with 40 CFR 264.1060, and to 40 CFR 1033.(h), 1033(i), and/or 1033(j).

Repairs of valves may be delayed at CHK beyond the first unit shutdown in the event that the repair requires spare parts which were well stocked prior to the shutdown but were depleted and unavailable at the time of shutdown. Additional delays beyond the second unit shutdown will only occur if the second shutdown occurs within six (6) months after the first.

N-3b <u>**Pumps:**</u>

Repairs of pumps will be delayed by CHK beyond fifteen (15) calendar days if the repair requires the use of a dual mechanical seal and barrier fluid system. Such delayed repairs of pumps will be completed as soon as practicable but no later than six (6) months from the time the leak was detected.

N-4 Alternative Standards - Valves in Gas/Vapor Service or Light Liquid Service:

N-4a Percentage of Valves Allowed to Leak

All valves at the CHK facility in light liquid or gas service are identified on the attached drawings, are associated with hazardous waste management units, are subject to 264.1057, and are eligible for this alternative standard. CHK elects to meet the two (2) percent standard for valves by meeting the following requirements of 264.1061 (b) (1) - (3).

A copy of the letter notifying the Regional Administrator of CHK's implementation of this alternative standard is included in Appendix N-B.

A performance test using the method specified in 264.1063 (b) was performed on all identified valves at the facility on December 17, 1990. No leaks greater than 10,000 ppm were detected in any valves. This test shall be repeated annually and at the request of the Regional Administrator.

Future annual performance tests shall detect a leak if readings exceed 10,000 ppm. If a leak is detected, it will be repaired in accordance with 264.1057 (d) and (e).

Future annual performance tests shall calculate the percentage leak rate by dividing the number of valves with readings in excess of 10,000 ppm by the total number of valves eligible. The initial performance test conducted in December 1990 did not detect any leaking valves. The resulting leak rate for the initial performance test of zero (0) percent meets the two (2) percent standard.

Should CHK decide to discontinue meeting this alternative standard, the Regional

Administrator will be notified.

N-4b <u>Skip Period Leak Detection and Repair</u>

CHK does not elect to meet this alternative standard for valves in the regulated service at this time. Should CHK elect to meet this alternative standard in the future, the Regional Administrator shall be notified and the program revised to comply with 264.1062 (b).

N-5 <u>Test Methods and Procedures</u>

The test methods used by CHK comply with 264.1063. Relevant instrument and method information is included in this document as Appendix N-C.

Monitoring performed at CHK is done in accordance with Method 21 as set forth in 40 CFR Part 60.

The instrument currently being used for monitoring is a Foxboro OVA Model 108; other instruments may be utilized depending on performance and instrument availability. The performance criteria for this instrument against Method 21 requirements are well documented and are included in Appendix N-C. The instrument is calibrated according to Method 21 requirements and the results documented as part of the monitoring. Examples of calibration forms for documenting this information appear in Appendix N-C. Calibration gases conform to Method 21 requirements and are documented with each calibration (see Appendix N-C). Future monitoring procedures, monitoring equipment, and calibration of that equipment shall comply with 40 CFR 264.1063.

N-5a <u>Testing for No Detectable Emissions</u>

The only equipment at CHK designated as meeting the "no detectable emission" standard are pumps meeting the criteria of 264.1052 (e). These pumps will be monitored annually following the procedures of 264.1052 (b). The background levels will be recorded as set forth in Method 21 in determining the leakage rates from these pumps.

When monitoring for leaks, the instrument probe is traversed around all potential leak sources from these pumps as close to the interface as possible as described in Method 21.

The background value shall be subtracted from the highest reading on each pump in determining compliance with the 500 ppm level for no detectable leakage.

N-5b <u>Testing Organic Concentration</u>

All identified hazardous waste equipment in waste service contacts ten (10) percent or greater liquid wastes. CHK has made this determination based on knowledge of the waste streams handled by CHK and complies with 264.1063 (g). Additional testing using methods stipulated by paragraphs 264.1063 (d) (1) and (2) for this initial designation is not required at CHK Since all identified hazardous waste equipment has been designated as being in light liquid, ten (10) percent or greater organic liquid waste service, documentation of this determination based on knowledge of process is not required.

Should CHK determine that a system can be designated as contacting less than ten (10) percent organic concentration streams, or the Regional Administrator does not agree that a stream contains less than ten (10) percent by weight organics, the determination will only be revised after following the procedures in 264.1063 (d) (1) or (2).

Any samples used to determine the percent organic content shall be representative of the highest total organic content hazardous waste that is expected to be handled in or contact the equipment.

Since all equipment at the CHK facility has been designated in light liquid service, no waste constituent vapor pressure determinations are necessary.

No control device efficiency tests are performed at the CHK facility since emissions reductions using control devices are not required by 264.1034.

N-6 Recordkeeping Requirements

CHK is subject to the leak detection and repair requirements only and has no closed vent or control devices. The recordkeeping provisions of this paragraph for the Subpart BB program only apply to CHK. Although CHK is owned by Clean Harbors and is part of a multiple facility system subject to these standards, CHK elects to maintain the required records on site. Additional information on this program for CHK may also be maintained at Clean Harbors corporate office in Braintree Massachusetts.

N-6a Equipment Information

The identification numbers for equipment subject to leak detection and repair requirements and associated hazardous waste management units appear in the Tables in Appendix N-D. The numbers separate the equipment into two categories. Valves and connections are identified with PXXX number, pumps are identified by a MXXX number. These numbers are unique to each piece of equipment.

Drawings of the process and facility plot plan are included in Appendix N-A. These drawings also show each piece of equipment subject to these standards and their identification numbers. The exact location of each piece of equipment is identified for monitoring and repair tracking from this information.

The tables in Appendix N-D include equipment descriptions, types, models, serial numbers, and operating characteristics where available.

Hazardous waste streams handled at the CHK facility have been assumed to exceed the ten (10) percent organic content limit and a majority are liquids. The gas/vapor service equipment is identified by type of associated process. This service is limited to equipment on condensers and vent lines, and is identified in the tables included in Appendix N-D. All pipelines subject to these standards are identified as being in either vapor or liquid service in the pipe line lists in Appendix N-D. Light liquid services are identified by the identification number for the pipeline in which the equipment is installed. K-XXX represents a kiln fuel service, N-XXX represents a non-chlorinated organics service, C-XXX represents a chlorinated organics service, W-XXX represents an aqueous organics service, and O-XXX represents waste oil service.

Each piece of equipment subject to 40 CFR Subpart BB standards is marked in such a manner that it can be distinguished readily from other pieces of equipment. Markings include identification tags and/or color coding as appropriate.

N-6b Method Of Compliance

Pumps are monitored monthly in accordance with 264.1052 (a), (b), and (c); except for those pumps listed in Appendix N-E. Those pumps are tested for compliance with no detectable emissions standards annually.

Valves are tested annually for leaks in accordance with 264.1061, (standards allowing no greater than two (2) percent of the valves to leak); except for those valves that are designated as difficult to monitor. These valves are monitored for leaks annually.

Flanges and other connectors are inspected weekly and monitored if evidence of a leak is found.

All open-ended valves and lines at the CHK facility are equipped with caps or plugs intended to seal the open end when the line or valve is not in service. All double block lines at the facility are operated such that the valve on the hazardous waste stream side is closed before the second valve is closed.

N-6c Control Devices

No control devices are required on the units at the CHK facility, so no implementation schedule for their installation, their design, or performance test plans have been prepared.

N-6d Leak Identification

Whenever a leak is detected on any equipment, a weatherproof tag shall be attached showing the equipment identification number, the date a potential leak was visually identified, the date a leak was detected in accordance with 264.1058 (a). This equipment identification tag will be removed after repair except for valves.

The equipment identification tag will remain on repaired valves until two (2) successive months of monitoring indicate that the leak has been repaired by measurements less than 10,000 ppm.

When a leak has been detected by exceeding a 10,000 ppm measurement, information on the leak and its repair will be documented and made part of the operating record. An example of the leak reports and repair records are included in Appendix N-F. This information shall include the following.

- The instrument and operator and the leaking equipment identification number.
- The date a potential leak was identified.
- The date a leak was detected by exceeding 10,000 ppm on the instrument and the date of each attempted repair.

- The repair method applied with each attempt to repair the leak.
- The monitoring results following each repair attempt and the indication of "greater than 10,000 ppm" if the reading is above 10,000 ppm.
- The notation "Repair Delayed" if repairs are delayed past fifteen (15) days.
- Documentation of the repair delay in accordance with 264.1059 (c).
- The signature of the owner or operator whose decision it is to delay the repair due to the need for a hazardous waste management unit shutdown.
- The expected date of successful repair of the leak if it is not repaired within fifteen (15) days.
- The date of successful repair.

N-6e **Equipment List**

The list of equipment subject to the requirements of 264.1052 through 264.1060 appears in the tables in Appendix N-D.

N-6f **No Detectable Emission Equipment**

A list of equipment designated by CHK as meeting the no detectable emissions standards for pumps from 264.1052 (e) appears in Appendix N-E along with a statement signed by Clean Harbors designee at the CHK facility.

The dates of the compliance tests, the background value, and the highest value measured for each pump designated according to 264.1052 (e) and identified according to paragraph (g) (2) (i) of this section appears in Appendix N-F along with all field records of the monthly monitoring performed on all regulated equipment at the CHK facility.

N-6g **Pressure Relief and Vacuum Equipment**

There are no pressure relief devices at the CHK facility subject to this requirement.

N-6h **Difficult to Monitor Valves**

Valves that have been identified as difficult to monitor are identified in the tables in Appendix N-D by the identification number P-XXXU/PXXXU or M-XXXU/MXXXU. CHK does not elect to identify any equipment as unsafe-to-monitor at this time. The difficult-to-monitor valves identified pursuant to 264.1057 (h) listed in the tables in Appendix N-D are all located at or above two (2) meters above a supported surface. The valves will be monitored annually when a portable structure capable of safely supporting monitoring personnel can be scheduled.

N-6i Process Information for Exemptions

Information is available in the facility records that indicate the design capacity of the hazardous waste management units.

The facility operating record includes information on the influent and effluent of each hazardous waste management unit subject to these requirements.

No hazardous waste management unit exclusively handles heavy liquids and all equipment is covered by sections of the requirements which apply to light liquids. All identified hazardous waste equipment in waste service contacts waste with ten (10) percent or greater organics. CHK has made this determination based on knowledge of the waste streams. No exemptions are currently being claimed on the basis of weight percent organics in the waste stream or type of liquid service (heavy or light). This information constitutes the supporting information on the applicability of these requirements at the CHK facility and will be updated on a regular basis.

N-6j Operating Information

The records required by 264.1064 (d) and (e) will be maintained on site for a period of three years.

N-6k Additional Fugitive Emission Requirements

CHK is not subject to the additional requirements from 40 CFR Part 60, subpart VV; or Part 61, subpart V; and therefore cannot document compliance with this section using duplicative information.

N-7 SUBPART CC - COMPLIANCE PROGRAM - AIR EMISSION STANDARDS FOR TANKS,

The WICHITA facility has various waste management units that are regulated under the requirements of Subpart CC. This Subpart applies to tanks, surface impoundments, containers and miscellaneous units, which are used to manage hazardous wastes with an average volatile organic concentration of equal to or greater than 500 ppm by weight at the "point of waste origination".

The "point of waste origination" is defined in 40 CFR 265.1081 as follows:

> *For a generator, the point of waste origination is the point where a solid waste is produced, or is determined to be a hazardous waste as defined in 40 CFR 261.*
>
> *For a TSDF which is not the generator of the waste, the point of waste origination is defined as the point where the facility owner or operator first accepts delivery or takes possession of the waste. At WICHITA, this would be the point where the wastes first enter the facility.*

N-7a Affected Units/Activities

N-7b Surface Impoundments and Miscellaneous Units

The WICHITA facility does not currently operate any surface impoundments, or miscellaneous units therefore the RCRA Subpart CC requirements associated with these of units are not applicable and will not be discussed.

N-7c Tanks

Subpart CC established two levels of air controls for tanks: Level 1 and Level 2. Under Level 1, fixed-roof tanks may operate without emission control devices and without periodic air monitoring for leak detection provided that certain restrictions regarding tank design/operation and maximum organic vapor pressure (MOVP) limits are met. Any tank that does not qualify for Level 1 controls must comply with the Level 2 control standards which require more sophisticated emission control techniques (e.g., floating roofs, control devices, etc.) and mandatory, periodic air monitoring for leak detection. The WICHITA facility operates eight (8) storage tanks which are affected by Subpart CC. These tanks and their capacities are as follows.

Tank Farm			
Tank	V-1	7,363	gallons
Tank	V-2	7,363	gallons
Tank	V-3	7,363	gallons
Tank	V-4	7,363	gallons
Tank	V-5	20,985	gallons
Tank	V-6	20,895	gallons
Tank	V-7	7,363	gallons
Tank	V-8	7,363	gallons

N-7d <u>Tank Level Emission Control Standards</u>

Level 1-tank standards are applicable if any the following criteria are met:

A. The MOVP of the hazardous waste in the tank is less than the MOVP limit for the tank's design capacity as provided below:

a. The tank design capacity is greater than or equal to 151 cubic meters (39,894 gallons) and the MOVP in the tank is not greater than 5.2 kpa (0.757 psia); or
b. The tank design capacity is greater than or equal to 75 cubic meters (19,815 gallons) but less than 151 cubic meters, and the MOVP in the tank is not greater than 27.6 kPa (4.02 psia); or
c. The tank design capacity is less than 75 cubic meters and the MOVP in the tank is not greater than 76.7 kPa (11.17 psia)

B. The waste is not heated to a temperature that is greater than the temperature at which the MOVP was determined; and

C. The waste is not treated using a stabilization process

All tanks at Wichita operated under Level 1 controls must be equipped with a fixed roof that meets the following requirements:

A. The fixed roof and its closure devices are designed to form a continuous barrier over the entire surface area of waste in the tank;
B. Each opening in the fixed roof is equipped with a closure device or connected to a closed vent that is vented to an air emissions control system; and

N-7e <u>Inspection/Monitoring Requirements</u>

The only regulated units presently subject to Subpart CC at the WICHITA facility are tanks and containers. The inspection and monitoring requirements applicable to these units are provided below.

N-7f Tanks Inspections

Tanks require a visual inspection to check for defects including, but not limited to:

A. Visible cracks, holes or gaps in the roof sections or between the roof and the tank wall;
B. Broken, cracked or otherwise damaged seals or gaskets on closure devices; and
C. Broken or missing hatches, access covers, or other closure devices.

This visual inspection must be conducted on or before the effective date of the rule (December 6, 1996) and annually thereafter. The results of the inspections must be documented and maintained on-site.

If a defect is noted during an inspection, the first efforts at repair of the defect must occur no later than five (5) calendar days after detection, and shall be completed as soon as possible, but no later than forty five (45) calendar days after detection. Repair of the defect may be delayed beyond 45 days if the repair requires emptying or temporarily removing the tank from service for repair and no alternative tank capacity is available at the facility to accept the waste that is normally managed in the defective tank. In the case of a delayed repair, the repair shall be made the next time the process or unit that is generating the waste managed in the defect tank stops operation. Repair of the defect shall be completed before the process or unit resumes operation.

N-7g Record Keeping Requirements

All Subpart CC records shall be kept for a minimum of three (3) years. Design information, equipment certification information, and design analyses of performance tests shall be kept in the facility records for the life of the equipment. Unit specific recordkeeping requirements are provided below

3.1 The following information shall be recorded for those tanks subject to Subpart CC at WICHITA :

(A) Tank identification number, or other unique identifier;

(B) A record of each inspection required by 40 CFR 265.1085, including:

(1) Date of inspection

(2) For each defect identified:

a) Location of the defect

(b) Description of the defect

(c) Date of detection

(d) Corrective action taken to repair the defect

(e) Reason for delay of repair (if any)

(f) Expected date of completion of delayed repair

(C) For a fixed roof Level 1 control tank, the MOVP determination performed in accordance with 40 CFR 265.1085

(D) Information concerning units that are "unsafe to inspect and monitor" per 40 CFR 265.1085(1) or 265.1086(g):

(1) Identification numbers for units with covers that have been designated "unsafe to inspect and monitor"

N-7h <u>Reporting Requirements</u>

1. Under Subpart AA and BB, the facility must report the following to the Regional Administrator within 15 days (264.1090).

- Each occurrence when hazardous waste containing VOCs in excess of 500 ppmw is placed into a container which is not part of this plan or has not been designated as complying with this plan (e.g., into a "exempt" unit).

N-8 Containers

N-8a Standards for containers

The RCRA Subpart CC standards for containers apply to all containers which contain a hazardous waste with a concentration of 500 ppmv or greater. Per 40 CFR 264.1086, there are three levels of emissions controls for containers apply to all volatile organic (i.e., Level 1, 2 or 3), depending on the following criteria:

A. The design capacity of the container;
B. Whether or not the container is being used "in light material service". The term "in light material service" means that the waste contains at least 20% (by weight) organic constituent(s) that have (in pure form) a vapor pressure equal to or greater than 0.3 kilopascals (0.044 psia); and
C. The use of the container for stabilization treatment processes.

Per 40 CFR 264.1086(c), Level 1 container standards apply to:

A. Containers with a design capacity between 26 and 119 gallons; or

B. Containers with a design capacity greater than 119 gallons and containing a hazardous waste that is not "in light material service". For a non-DOT container with a capacity greater than 119 gallons, the facility must maintain a copy of the procedure used to determine that the container is not "in light material service".

Per 40 CFR 264.1086(d), Level 2 container standards apply to containers with a design capacity exceeding 119 gallons and containing a waste that is "in light material service".

Per 40 CFR 264.1086(e), Level 3 container standards apply to containers with a design capacity greater than 26 gallons which are used in a stabilization treatment process.

The specific management and air emission control requirement for the three levels of controls are described in following sections.

N-8b Level 1 Emission Control Standards for Containers

Level 1 container emission control standards require the use of one of the following types of containers:

A. A container that meets U.S. DOT packaging regulations specified in 49 CFR 178 and 179; or
B. A container that is equipped with a cover and closure devices that form a continuous barrier over the container openings such that when secured, there are no visible holes, gaps, or other open spaces into the interior of the container. The cover may be a separate cover (e.g., lid on a drum, tarp on a rolloff) or may be an integral part of the container structural design (e.g., a portable tank) *i* or
C. An open-top container in which an organic-vapor suppressing barrier is placed on or over the hazardous waste such that no hazardous waste is exposed to the atmosphere (e.g., a vapor suppressing foam).

Under Level 1 controls, all covers and closure devices must be composed of materials that are suitable to minimize waste exposure to the atmosphere and maintain equipment integrity for as long as it is in service. In addition, covers and closure devices must be secured and closed at all times, except in the following cases:

A) Adding waste or other material is allowed, provided:

(1) For continuous filling to the final level, closure devices and covers must be secured upon conclusion of the filling operation.

(2)For intermittent filling to final level, closure devices covers must be re-secured/re-closed when:

A. Final volume is reached
B. Completion of batch with no material additions within 15 minutes
C. Person loading the container leaves the immediate vicinity, or
D. Process generating the waste is shutdown.

(B)Removing waste is allowed, provided:

(1) RCRA-empty containers (per 261.7(b)) do not require a secured/closed cover or closure device
(2) For intermittent removal operations, the closure and covers must be re-secured/re-closed when:

a. Removal operation is complete but container is not RCRA-empty
b. Completion of batch with no material removals within 15 minutes, or
c. Person unloading the container leaves the immediate vicinity.

C) Pressure-relief, conservation vents, and similar devices which vent to the atmosphere are allowed during normal operating conditions for the purpose of maintaining container internal pressure in accordance with the design specifications of the container. The device must be designed to operate with no detectable emissions when the device is secured in the closed position. The setting of the device must be established based on manufacturer recommendations, fire protection codes, standard engineering practices, etc

D) Opening of a closure device or cover is allowed when access to the inside of the container is needed to perform routine activities other than transfer operations.

Examples include opening ports or manholes to sample the waste or access equipment in the container. Following completion of the activity, the cover or closure device must be secured/closed.

All "DOT containers" that are used to comply with Level 1 (or Level 2) container controls must meet the following DOT regulations on packaging of hazardous materials:

All "DOT containers" that are used to comply with Level 1 (or Level 2) container controls must meet the following DOT regulations on packaging of hazardous materials:

(A) The container must comply with:

(1) 49 CFR 178 Specifications for Packaging, or

(2) 49 CFR 179 - Specifications for Tank Cars.

(B) The hazardous waste is managed in the container in accordance with:

(1) 49 CFR 107, Subpart B - Exemptions

(2) 49 CFR 172 - HMT, Special Provisions, Communication, Emergency Response, & Training

(3) 49 CFR 173 General Requirements for Shippers and Packages

(4) 49 CFR 180 - Continuing Qualification and Maintenance of Packaging

DOT exception packaging allowed in 49 CFR Part 178 & 179 are not considered to be "DOT containers" that are exempt from Subpart CC air controls/monitoring, and must be managed under Level 2 controls (i.e. operate with no detectable emission, or as a "vapor-tight'. container). However, lab packs that are packed in accordance with 49 CFR 173.12(b) and managed in accordance with 49 CFR 178 are considered to be "DOT containers" for the purposes of complying with Subpart CC.

N-8c <u>Level 2 Emission Control Standards for Containers</u>

Level 2 container emission control standards require the use of one of the following types of containers:

A. A container that meets U.S. DOT packaging regulations; or
B. A container that operates with "no detectable organic emissions" as determined through the monitoring of all closures using a PID, FID, or similar instrument in accordance with 40 CFR 264.1086(g); or
C. A container that has been demonstrated within the preceding 12 months to be vapor-tight using Method 27 in 40 CFR 60 Appendix A in accordance with 40 CFR 264.1086(h).

Transfers in/out of a Level 2 container must manner that minimizes exposure of hazardous waste .

The procedure specified in 265.1084(d) must be used to demonstrate that a container is operating with no detectable organic emissions. Under that procedure, each potential leak interface on the container, cover, and associated closure devices must be checked. Interfaces include, but are not limited to, the interface of the cover rim and the container wall, the periphery of any opening on the container, and the sealing seat interface on a spring-loaded pressure-relief valve. The test must be conducted when the container is filled with a material having a VO concentration representative of the VO concentrations for the hazardous waste expected to managed in the container. The cover and all closure devices must remain closed during the test.

The procedure specified in 40 CFR 60 Appendix A, Method 27, must be used to demonstrate that a container is vapor-tight. The test must be performed in accordance with Method 27 requirements using a pressure measurement device that has a precision of +/-

2.5 mm water and that is capable of pressure measurements above the pressure at which the container is to be tested. The container is considered vapor-tight when it sustains a pressure change of less than or equal to 750 Pascals within 5 minutes after it is pressurized to a minimum of 4,500 Pascals.

N-8d **Level 3 Emission Control Standards for Containers**

Level 3 container emission control standards require the use of one of the following types of containers:

A. A container that is vented directly through a closed-vent system to a control device operating in accordance with 40 CFR 264. 1086 (e) (2) (i i); or
B. A container that is vented into an enclosure which is exhausted through a closed-vent system to a control device in accordance with 40 CFR 264.1086 (e)(2)(i) and (e)(2) ii)
.

A Level 3 closed-vent system and control device must be designed and operated in accordance with 40 CFR 265.1088. A Level 3 container enclosure must be designed and operated in accordance with the permanent total enclosure criteria in 40 CFR 52.741, Appendix B (i.e., "Procedure T"). The Procedure T verification procedures must be conducted when the enclosure is first installed, and annually thereafter.

Level 3 container controls must be inspected and monitored in accordance with 40 CFR 265.1088. In addition, owners/operators of Level 3 container controls must prepare and maintain the records specified in 40 CFR 265.1090.

WICHITA does not currently operate any containers subject to Level 3 control requirements at this time. Only wastes containing less than 500 ppmw will be stabilized on-site.

N-8e DOT Packaging Greater Than 119 Gallons

Containers of hazardous waste that have a design capacity of greater than 119 gallons, that operate "in light material service", and that meet a DOT design specification in 49 CFR 178/179 are subject to the Level 1 inspection, filling/emptying, and opening/closing requirements described above. In addition, the following requirements apply:

a. Waste transfer operations involving containers requiring Level 2 controls must be conducted to minimize exposure of hazardous waste to the environment. Acceptable loading procedures include, but are not limited to, the use of submerged fill, vapor balancing, or vapor recovery techniques.
b. If a container is downgraded to Level 1 controls because it is not operating "in light material service", the facility must keep a copy of the procedure that was used to determine that the container is not in light material service. For the purposes of complying with this requirement, such determinations shall be made during the initial waste prequalification process based on information provided by the generator.

N-8f Non-DOT and DOT-Exemption Packaging Greater Than 119

Containers of hazardous waste that have a design capacity of greater than 119 gallons, that are used "in light material service", and that do not meet a DOT design specification in 49 CFR 178/179 (i.e., "non-DOT containers") or that are designed, manufactured and operated pursuant to a DOT-exemption are subject to the Level 1 inspection, filling/emptying, and opening/closing requirements. In addition, the following requirements apply:

(A) Waste transfer operations involving containers requiring Level 2 controls (i.e., one that is operating "in light material service") must be conducted to minimize exposure of hazardous waste to the environment. Acceptable loading procedures include, but are not limited to, the use of submerged fill, vapor balancing, or vapor recovery techniques;

(B) If a container is downgraded to Level 1 controls because it is not operating "in light material service", the facility must keep a copy of the procedure that was used to determine that the container is not in light material service. For the purposes of complying with this requirement, such determinations shall be made during the initial waste prequalification process based on information provided by the generator; AND

(C) Level 2 containers must operate with "no detectable organic emissions". Such container must be checked (e.g., by PID, FID, or other instrument) for leaks at all container/closure interfaces. The leak detection test is required at the point of generation. WICHITA need not conduct a leak test when such a container arrives at the facility, but would have to conduct the leak test when generating an outbound load of hazardous waste; OR

(D) Level 2 containers must operate as "vapor-tight" containers. Such container must be tested using EPA Method27. The vapor-tight test is required prior to initial use of
the container. WICHITA need not conduct a "vapor-tight" test when such a container arrives at the facility, but would have to ensure that such a container was tested within the previous 12 months prior to using the container for an outbound load of hazardous waste.

N-8g Recordkeeping

Containers using Level 1 or Level 2 controls do not require any recordkeeping, except in the case where a container is downgraded to Level 1 controls because it is not operating "in light material service". In such cases, WICHITA will keep a copy of the procedure used to determine that the container is not in light material service.

WICHITA does not intend to operate any containers in Level 3 service. Therefore, the recordkeeping requirements that apply to Level 3 are not applicable.

N-9 Reporting Requirements 40 CFR 264.1065

If CHK fails to repair any leaks from valves, pumps, and compressors as required by 264.1057,(d), 264.1052(c) and (d)(6), or 264.1053(g), A Semiannual report will be submitted by CHK to the regional Administrator listing the following information as applicable:

1) CHK's EPA Identification number, name and address
2) For each month during the covered timeframe:

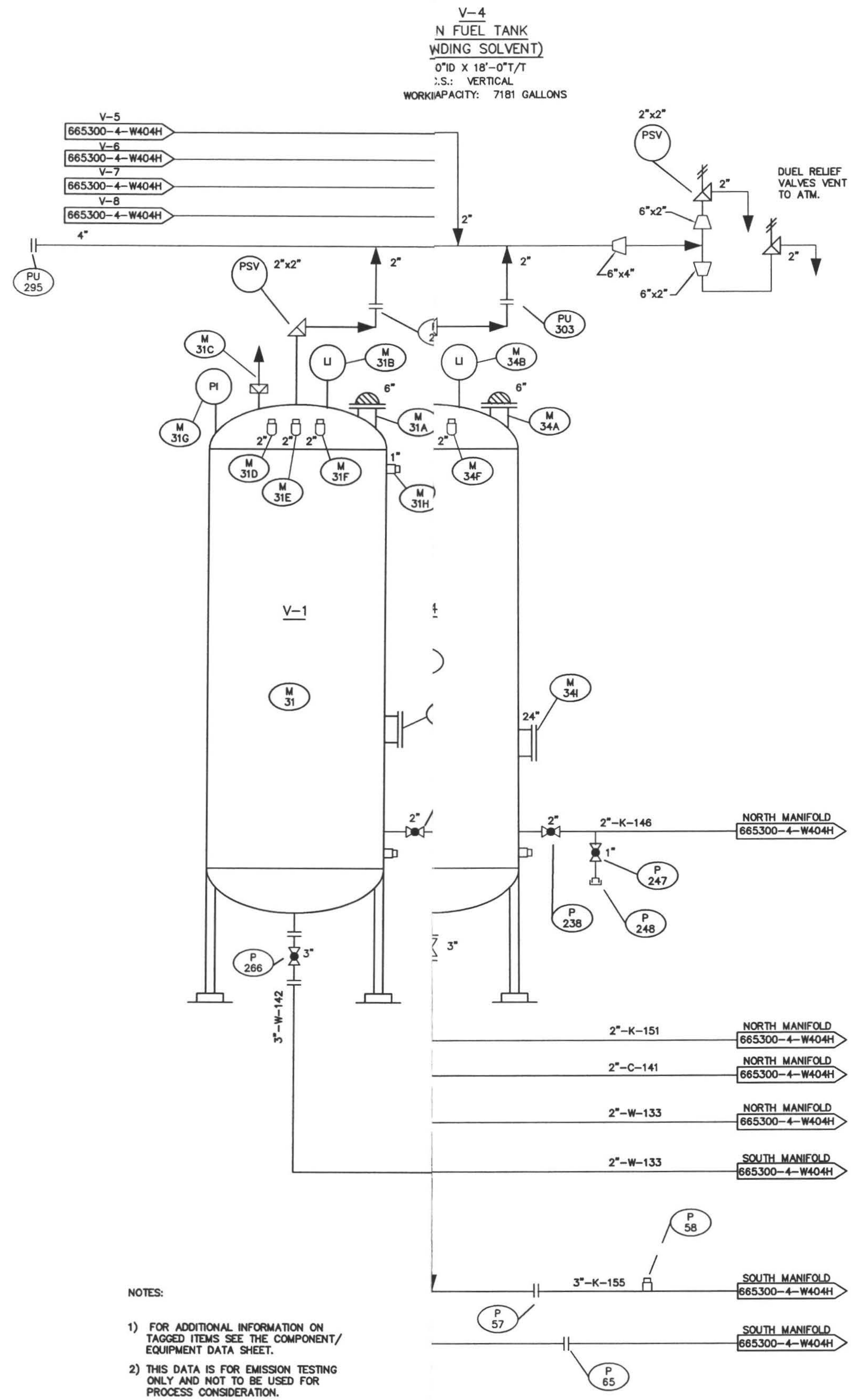
   The equipment id. Number for each valve which was not repaired as required 264.1057,(d)

   The equipment id. Number for each pump which was not repaired as required by 264.1052(c) and (d)(6)

   The equipment id. Number for each compressor which was not repaired as required by 264.1053(g),
3) Date of Hazardous waste management unit shutdowns that occurred within the covered period.

Appendix N-A - Facility and Process Drawings

Drawing Number	Subject
665300-4-W404G	Tank Farm I/V-1, V-2, V-3 & V-4
665300-4-W404H	Tank Farm II/V-5 Thru V-8/N & S Manifolds
665300-4-W511-1	Tank Farm



NOTES:

1) FOR ADDITIONAL INFORMATION ON TAGGED ITEMS SEE THE COMPONENT/ EQUIPMENT DATA SHEET.

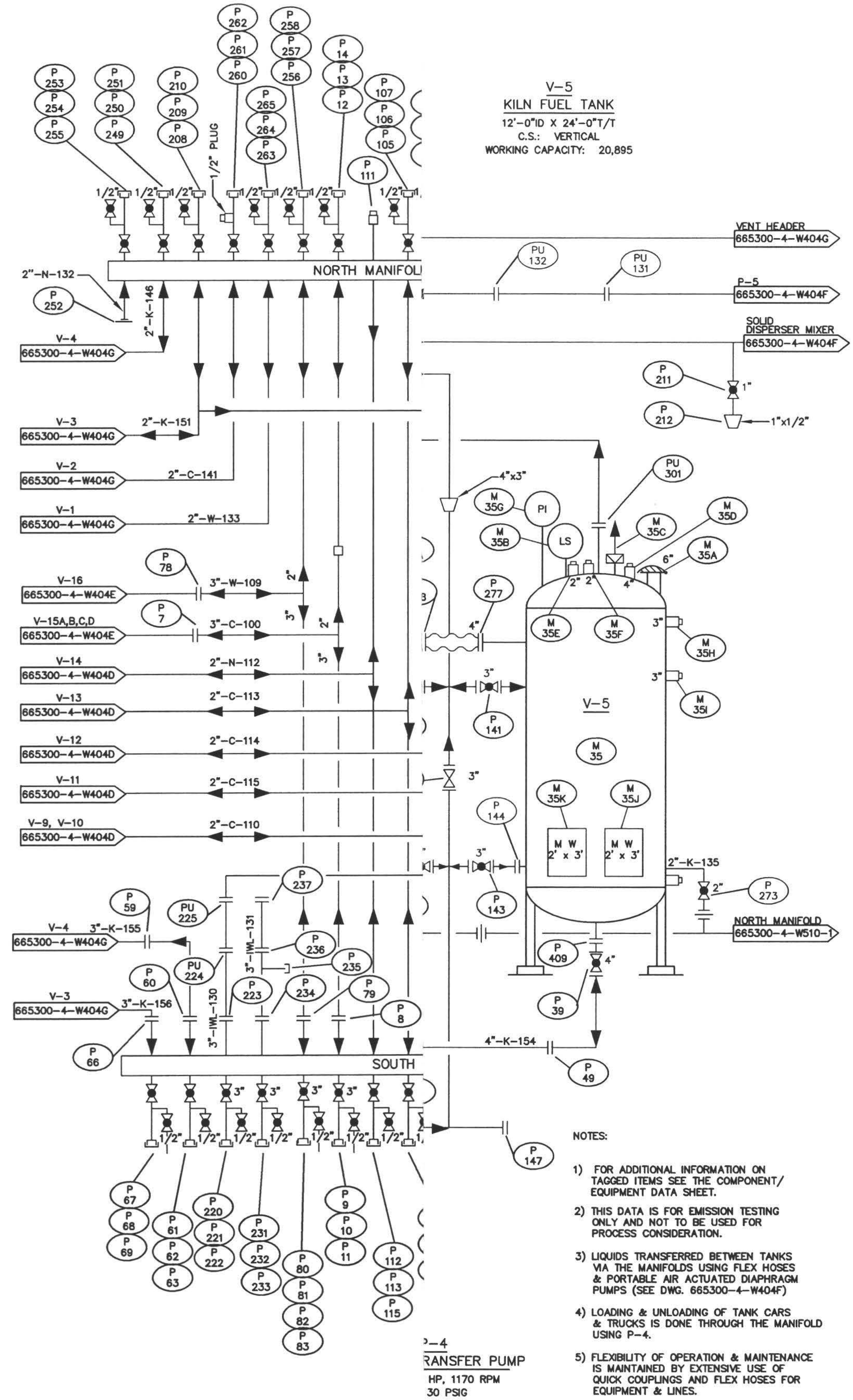
2) THIS DATA IS FOR EMISSION TESTING ONLY AND NOT TO BE USED FOR PROCESS CONSIDERATION.

FIGURE 201

anHarbors

TITLE	
CLEAN HARBORS KANSAS, LLC WICHITA FACILITY PIPING & INSTRUMENTATION DIAGRAM TANK FARM I/V-1, V-2, V-3 & V-4	

CKED	SCALE	DATE	DRAWING NO.	REV.
I.C.	NONE	06/17/08	P&ID-W404G	B



NOTES:

1) FOR ADDITIONAL INFORMATION ON TAGGED ITEMS SEE THE COMPONENT/ EQUIPMENT DATA SHEET.
2) THIS DATA IS FOR EMISSION TESTING ONLY AND NOT TO BE USED FOR PROCESS CONSIDERATION.
3) LIQUIDS TRANSFERRED BETWEEN TANKS VIA THE MANIFOLDS USING FLEX HOSES & PORTABLE AIR ACTUATED DIAPHRAGM PUMPS (SEE DWG. 665300-4-W404F)
4) LOADING & UNLOADING OF TANK CARS & TRUCKS IS DONE THROUGH THE MANIFOLD USING P-4.
5) FLEXIBILITY OF OPERATION & MAINTENANCE IS MAINTAINED BY EXTENSIVE USE OF QUICK COUPLINGS AND FLEX HOSES FOR EQUIPMENT & LINES.

FIGURE 202

nHarbors		TITLE: CLEAN HARBORS KANSAS, LLC WICHITA FACILITY PIPING & INSTRUMENTATION DIAGRAM TANK FARM 2/V-5 , V-6, V-7 & V-8	
CKED	SCALE	DATE	DRAWING NO.	REV.
.C.	NONE	06/17/08	P&ID-W404H	B

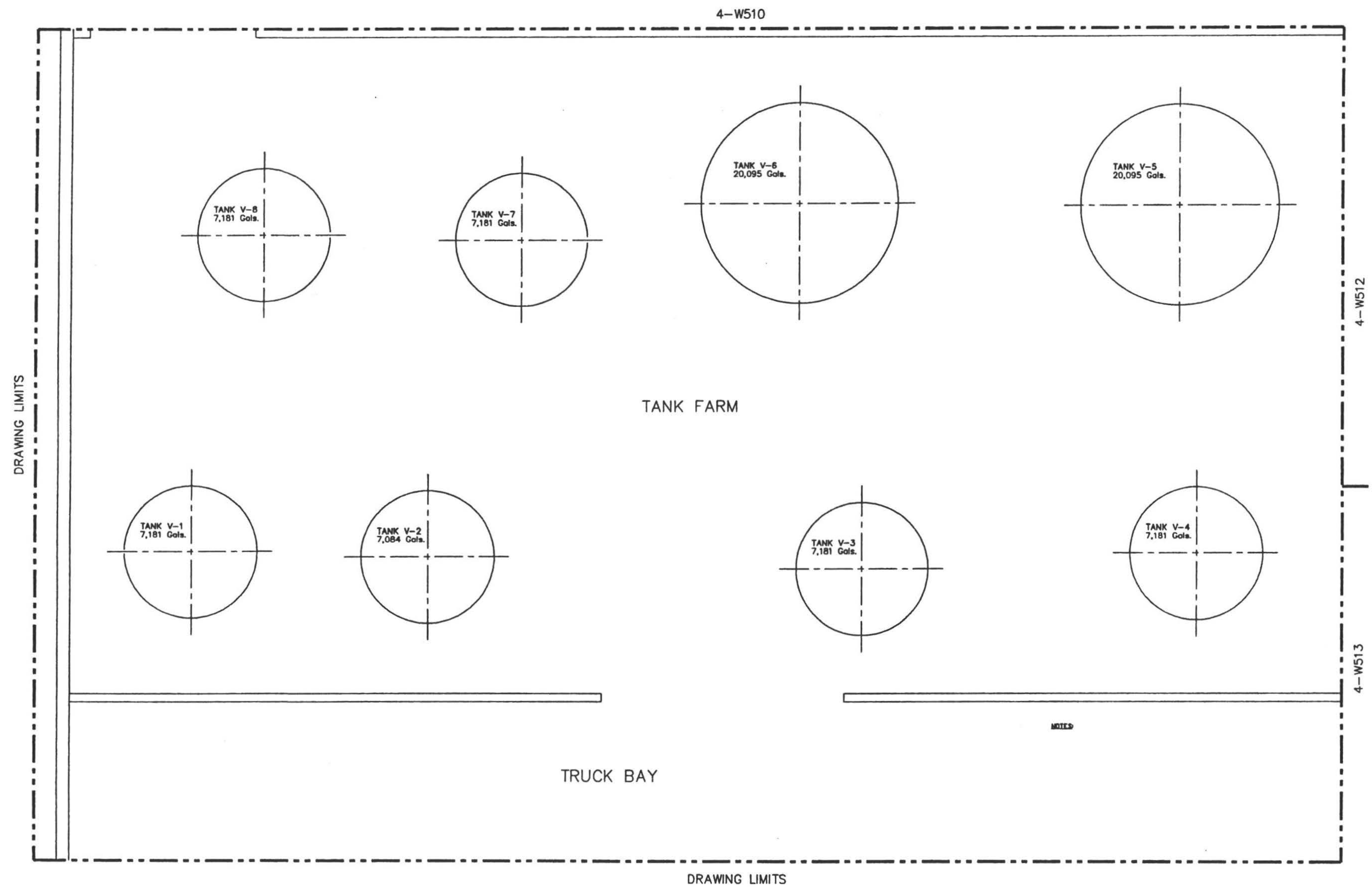


FIGURE J-2

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/06	M.C.

REFERENCE DRAWINGS

CleanHarbors

TITLE: CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
TANK FARM1/2 TANK LOCATIONS

DRAWN	CHECKED	SCALE	DATE	DRAWING NO.	REV.
K.M.C.	M.C.	3/8"=1'-0"	06/17/06	TKFRM1/2-W511-1	A

Appendix N-B - Regional Administrator Letter

USPCI

A Subsidiary of
Union Pacific Corporation

Hydrocarbon Recovery Services

December 21, 1990

Morris Kay
United States Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 60101

VIA CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Re: Hydrocarbon Recovery Services, Inc. of Wichita, EPA ID. No. KSD007246846, 40 CFR part 265, Subpart BB Program

Mr. Kay:

This letter is sent to notify you that, pursuant to paragraph 265.1061, subparagraph (b), Hydrocarbon Recovery Services, Inc. of Wichita (HRS) is electing to comply with the "2 percent of all valves leaking" standard as an alternative to monthly monitoring of it's valve equipment in hazardous waste light organic liquid service. A performance test of the applicable equipment was completed at our facility on December 17, 1990 and 0% were found to exceed the 500 ppm emission standard. If a leak is detected in any of this equipment it will be repaired pursuant to paragraph 265.1057 (d) and (e). Should you or your staff have any questions please contact me at 316-268-9490.

Sincerely,
HYDROCARBON RECOVERY SERVICES, INC. OF WICHITA

Stephen M Keiter

Stephen Keiter

cc: Thomas Gross, KDHE BOWM
Catherine Orban, HRS-Tulsa
Dave Coker, USPCI-Houston

2540 North New York Street, Wichita, Kansas 67219 · 316/267-5742 · Fax 316/267-8155

Appendix N-C - Monitoring Method and Equipment Documentation

METHOD 21. DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of volatile organic compound (VOC) leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.2 Principle. A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 3. A leak definition concentration based on a reference compound is specified in each applicable regulation. This procedure is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rates from individual sources.

2. Definitions

2.1 Leak Definition Concentration. The local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

2.2 Reference Compound. The VOC species selected as an instrument calibration basis for specification of the leak definition concentration. [For example: If a leak definition concentration is 10,000 ppmv as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument calibrated with methane would be classified as a leak. In this example, the leak definition is 10,000 ppmv, and the reference compound is methane.]

2.3 Calibration Gas. The VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a concentration approximately equal to the leak definition concentration.

2.4 No Detectable Emission. The local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is not present. Since background VOC concentrations may exist, and to account for instrument drift and imperfect reproducibility, a difference between the source surface concentration and the local ambient concentration is determined. A difference based on meter readings of less than 5 percent of the leak definition concentration indicates that a VOC emission (leak) is not present. (For example, if the leak definition in a regulation is 10,000 ppmv, then the allowable increase in surface concentration versus local ambient concentration would be 500 ppmv based on the instrument meter readings.)

2.5 Response Factor. The ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the application regulation.

2.6 Calibration Precision. The degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

2.7 Response Time. The time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

3.0 Apparatus

3.1 Monitoring Instrument.

3.1.1 Specifications.

a. The VOC instrument detector shall respond to the compounds being processed. Detector types which may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

b. The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

c. The scale of the instrument meter shall be readable to ±5 percent of the specified leak definition concentration.

d. The instrument shall be equipped with a pump so that a continuous sample is provided to the detector. The nominal sample flow rate shall be 1/2 to 3 liters per minute.

e. The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the applicable U.S.A. standards (e.g., National Electrical Code by the National Fire Prevention Association).

3.1.2 Performance Criteria.

a. The instrument response factors for the individual compounds to be measured must be less than 10.

b. The instrument response time must be equal to or less than 30 seconds. The response time must be determined for the instrument configuration to be used during testing.

c. The calibration precision must be equal to or less than 10 percent of the calibration gas value.

d. The evaluation procedure for each parameter is given in Section 4.4.

3.1.3 Performance Evaluation Requirements.

a. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

b. The calibration precision test must be completed prior to placing the analyzer into service, and at subsequent 3-month intervals or at the next use whichever is later.

c. The response time test is required prior to placing the instrument into service. If a modification to the sample pumping system of flow configuration is made that would change the response time, a new test is required prior to further use.

3.2 Calibration Gases. The monitoring instrument is calibrated in terms of parts per million by volume (ppmv) of the reference compound specified in the applicable regulation. The calibration gases required for monitoring and instrument performance evaluation are a zero gas (air, <10 ppmv VOC) and a calibration gas in air mixture approximately equal to the leak definition specified in the regulation. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within ±2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life. Alternately, calibration gases may be prepared by the user according to any accepted gaseous standards preparation procedure that will yield a mixture accurate to within ±2 percent. Prepared standards must be replaced each day of use unless it can be demonstrated that degradation does not occur during storage.

Calibrations may be performed using a compound other than the reference compound if a conversion factor is determined for that alternative compound so that the resulting meter readings during source surveys can be converted to reference compound results.

4. Procedures

4.1 Pretest Preparations. Perform the instrument evaluation procedures given in Section 4.4 if the evaluation requirements of Section 3.1.3 have not been met.

4.2 Calibration Procedures. Assemble and start up the VOC analyzer according to the manufacturer's instructions. After the appropriate warmup period and zero or internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value. [Note: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.]

4.3 Individual Source Surveys.

4.3.1 Type I--Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

a. Valves--The most common source of leaks from valves is at the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where leaks could occur.

b. Flanges and Other Connections--For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

c. Pumps and Compressors--Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

d. Pressure Relief Devices--The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

e. Process Drains--For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

f. Open-Ended Lines or Valves--Place the probe inlet at approximately the center of the opening to the atmosphere.

g. Seal System Degassing Vents and Accumulator Vents--Place the probe inlet at approximately the center of the opening to the atmosphere.

h. Access Door Seals--Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

4.3.2 Type II--"No Detectable Emission".

Determine the local ambient concentration around the source by moving the probe inlet randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and conduct a survey as described in 4.3.1. If an increase greater than 5 percent of the leak definition concentration is obtained, record and report the results as specified by the regulation.

For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

(a) Pump or Compressor Seals--If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described above.

(b) Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices--If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur prior to the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere prior to the control device, then it is presumed that no detectable emissions are present.

4.4 Instrument Evaluation Procedures. At the beginning of the instrument performance evaluation test, assemble and start up the instrument according to the manufacturer's instructions for recommended warmup period and preliminary adjustments.

4.4.1 Response Factor. Calibrate the instrument with the reference compound as specified in the applicable regulation. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration of approximately 80 percent of the applicable leak definition unless limited by volatility or explosivity. In these cases, prepare a standard at 90 percent of the saturation concentration, or 70 percent of the lower explosive limit, respectively. Introduce this mixture to the analyzer and record the observed meter reading. Introduce zero air until a stable reading is obtained. Make a total of three measurements by alternating between the known mixture and zero air. Calculate the response factor for each repetition and the average response factor.

Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in Section 5.

4.4.2 Calibration Precision. Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

4.4.3 Response Time. Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. Measure the time from switching to when 90 percent of the final stable reading is attained. Perform this test sequence three times and record the results. Calculate the average response time.

5. Bibliography

5.1 DuBose, D. A., and G. E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, N.C. Publication No. EPA 600/2-81-051. September 1981.

5.2 Brown, G. E., et al. Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle park, N.C. Publication No. EPA 600/2-81-022. May 1981.

5.3 DuBose, D. A., et al. Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental Protection Agency, Research Triangle Park, N.C. Publication No. EPA 600/2-81-110. September 1981.

CERTIFIED CALIBRATION

EPA METHOD 21

COMPANY__________________ CALIBRATION GASES: (2)

INSTRUMENT S/N___________ ________________________

MODEL____________________ ________________________

	(3) Zero Reading (PPM)	Zero Drift (PPM)	Cal Reading (PPM)	Cal Drift (PPM)	Response Time (SEC)
1.					
2.					
3.					

(1)Mean Value: Zero Drift:_____ ppm Cal Drift:_____ ppm

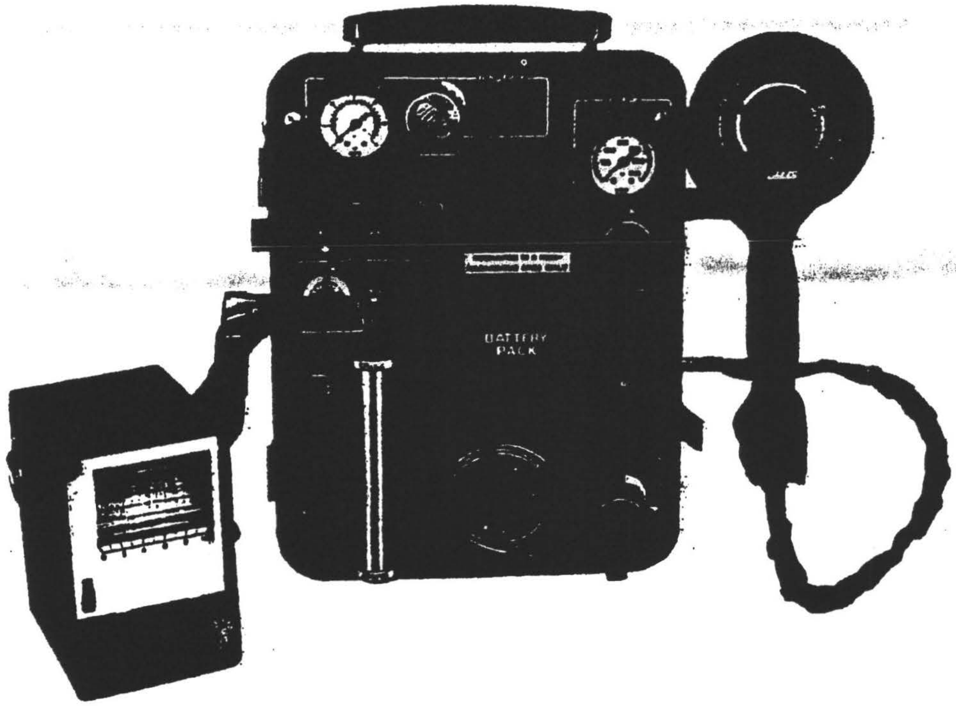
(5)Response Time:______ seconds

(4)Calibration Precision = $\frac{\text{Mean Cal Drift}}{\text{Cal Gas Concentration}}$ X 100 =____%

(1) Absolute Value
(2) Calibration Gas Concentration
(3) Zero Reading Must Be Less Than 10ppm
(4) Calibration Precision must be ≤ 10% of Calibration Gas Concentration
(5) Response Time must be ≤ 30 seconds

Calibrated by ___________________

Date ___________________



CENTURY OVA 108 PORTABLE ORGANIC VAPOR ANALYZER

The requirement for accurate and reliable environmental monitoring and leak detection is a high priority for industry. With the increased scope of environmental regulation, industry has a requirement for instrumentation that is application-oriented, and sufficiently flexible to meet changing needs. The dual mode CENTURY OVA 108 Portable Organic Vapor Analyzer is designed to meet these needs.

Several of the many OVA 108 features are:

- Provides continuous, direct readout of total organic vapor concentrations for survey purposes (Mode 1).
- Allows qualitative and quantitative analyses using the gas chromatographic mode (Mode 2).
- It is a light-weight, completely field-portable instrument weighing approximately 5.5 kg (12 lb), that provides eight hours of continuous operation per battery charge.
- Attenuation of ranges is not required.
- FM and BASEEFA certified intrinsically safe for use in Class I, Groups A, B, C, and D, Division 1 hazardous locations.
- Many hundreds of successful field-proven applications have demonstrated the exceptional reliability and ruggedness of this analyzer.
- Uses a flame ionization detector, which does not respond to ambient gases, such as CO and CO_2, and exhibits no sensitivity changes due to variations in relative humidity.

FOXBORO®

NTRODUCTION

The CENTURY OVA 108 is a highly sensitive analyzer that allows the detection of trace quantities of volatile organics and still maintains a large dynamic range capability. Using a logarithmic scale, the OVA 108 analyzes organics from 1 to 10 000 parts per million (ppm). This range provides for both low and middle range concentration information important to general environmental monitoring. It also has the ability to monitor the high levels required for process leak detection.

DESCRIPTION

The OVA 108 is a dual mode analyzer combining the features of a continuous survey, direct reading instrument and a gas chromatograph. The survey mode allows the continuous monitoring of total organics to provide the rapid identification of airborne organics. These values are reported directly in ppm methane equivalent. Upon the identification of the "hot spots" or high concentration areas, the gas chromatographic mode can be utilized to further analyze the sample, separating and reporting the various organic materials present and their concentrations. This combination of analytical modes provides the best flexibility necessary to meet the environmental management needs of industry. The OVA 108 is an easy to operate instrument that is able to withstand and surpass the most demanding application use.

PRINCIPLE OF OPERATION

Flame Ionization Detector

The CENTURY OVA 108 utilizes a flame ionization detector to monitor the presence of organic vapors.

The principle benefits of monitoring with a flame ionization detector are:

- Universal organic compound response with approximately the same high sensitivity for all.
- Flame ionization will not respond to changes in relative humidity or changes in CO and CO_2 concentration.
- It is a mass sensing detector which exhibits minimal effects from changes in temperature, pressure, or flow.
- Provides excellent dynamic range and concentration linearity.

Sample gathering is done by using a small diaphragm air pump. Detection requires a hydrogen delivery system, a sample delivery system, and an electronic amplification and display system. The hydrogen delivery system provides an eight hour supply of hydrogen gas (with a precisely controlled flow) to the detector. The sample delivery system provides air to the detector chamber to maintain the flame combustion and introduce the organic air contaminants for analysis. Figure 1 illustrates both the hydrogen flow and air flow patterns in the OVA 108.

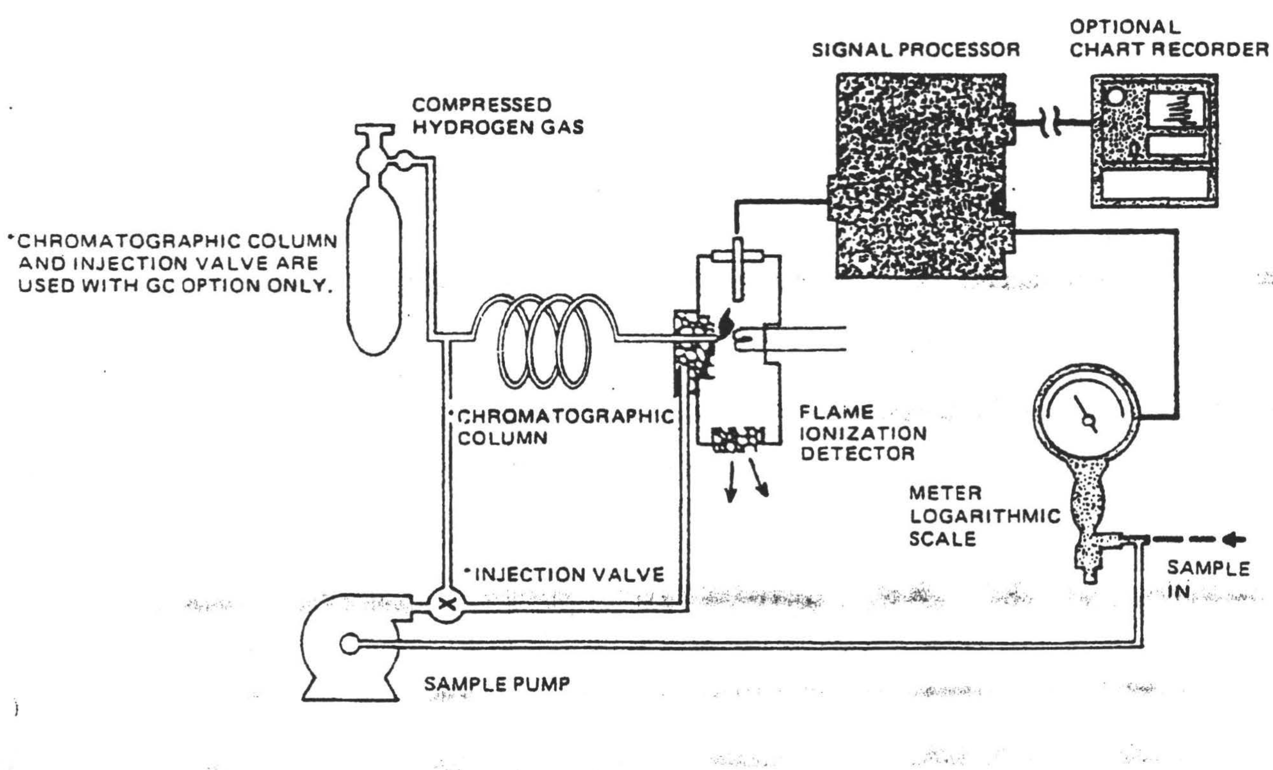


Figure 1. OVA 108 Schematic Diagram

Survey Analysis — Mode 1

In Mode 1, the air sample is delivered continuously to the detector chamber. When an organic vapor is exposed to the hydrogen flame via the air flow, the carbon molecules ionize and a current is carried between the detector electrodes. This current is proportional to the concentration of vapor in the sample. Different compounds will ionize to varying extents in the flame. The OVA 108 is internally calibrated for methane gas, and all survey responses are expressed in methane equivalent. The OVA 108 can be calibrated to read directly for other compounds, (for example, benzene) through the gas select adjustment dial on the instrument front panel.

Chromatographic Analysis — Mode 2

With Mode 2, the OVA 108 functions as a portable gas chromatograph utilizing hydrogen as a carrier gas and a flame ionization detector as the sensor. In this mode, a fixed volume of sample air is injected (by means of an air injection valve) into the chromatographic column which contains a suitable packing material. At the same time that a sample is introduced into the column, the remaining sample air is directed through an integral charcoal filter (not shown in Figure 1) to provide the detector with a supply of pure air.

While moving through the chromatographic column, the sample constituents are separated based on their interaction with the column packing material. As the constituents leave the column, they are carried to the detector and register on the logarithmic meter and the attached optional chart recorder. The time, measured from the moment of sample injection until the compound of interest exits the column, is known as the retention time and serves to identify the compound. The area under the chromatographic peak is proportional to the concentration of the compound in the air sample. The peak height can also be used to determine sample concentration since it closely correlates with peak area. Figure 2 illustrates an example of a logarithmic chromatogram.

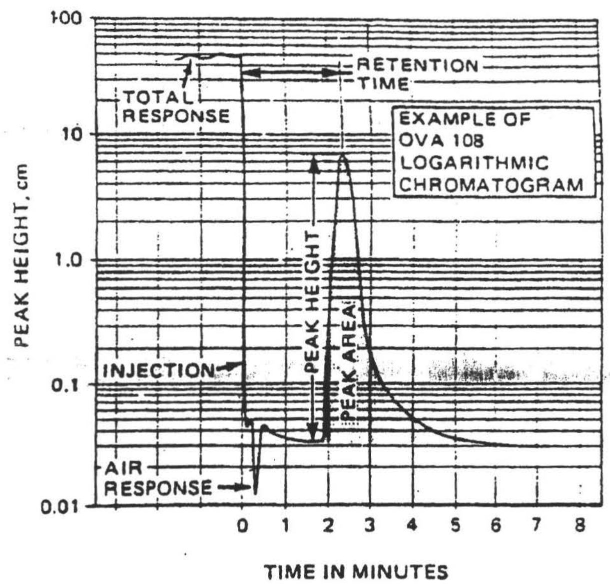


Figure 2. OVA 108 Generalized Chromatogram

OVA 108 APPLICATIONS

The OVA 108 is well-suited for use in the following typical applications:

- Process Leak Detection in the Petroleum, Chemical, or Natural Gas Industries
- Equipment Leaks of Volatile Organic Carbon (VOC), Reference Methods 18 and 22, Fugitive Emissions, EPA 40, Code of Federal Regulations (CFR), Part 60
- Landfill Monitoring
- Benzene Equipment Leaks, Fugitive Emissions Sources, EPA 40, CFR Part 61
- Equipment Leaks of VOC from Onshore Natural Gas Processing Plants, EPA 40, CFR Part 61
- Stack Monitoring for VOC
- Quality Control Monitoring Carbon Absorption Systems

STANDARD SPECIFICATIONS

Readout 1 to 10 000 ppm, logarithmic scale

Minimum Detectable Limit (Methane) 0.5 ppm

Response Time Approximately two seconds for 90% of reading

Fuel for Detector Hydrogen

Carrier Gas for Chromatograph Hydrogen (self-contained tank)

Sample Flow Rate Approximately 2 L/min

Concentration Alarm Audible alarm, user-selectable level

Electric Power 12 V dc rechargeable battery

Voltage Output to Recorder 0 to 5 V dc

Flame Out Indication Audible and visual

Operation Time in Portable Mode Eight hours

Filters Sintered metal, user-cleanable

Nominal Dimensions (Sidepack)
230 × 300 × 100 mm (9 × 12 × 4 in)

Approximate Mass 5.5 kg (12 lb)

PRODUCT SAFETY SPECIFICATIONS

EPA Reference Method 21

The Environmental Protection Agency, Reference Method 21, EPA 40, CFR Part 60, states the performance specifications by which volatile organic compounds (VOC) will be determined. These performance specifications ensure that instrumentation used to monitor VOC will report the data in a timely, accurate, and safe way. The CENTURY OVA 108 meets the specifications of Method 21 as follows:

1. Flame ionization is an approved detector.
2. The instrument shall be intrinsically safe and meet all aspects of Article 500 of the National Electrical Code of the United States — FM I/1/ABCD.
3. The instrument shall measure the prescribed leak level: example, 10 000 ppm.
4. The sampling rate shall be between 1/2 and 3 litres per minute. The OVA 108 sampling rate is 2 litres/per minute.
5. Accuracy shall be ±5% of the designated leak level.
6. Response time must be less than 30 seconds. The OVA 108 has a response time of approximately two seconds.

Electrical Classification

FM certified intrinsically safe for use in Class I, Groups A, B, C, and D, Division 1 hazardous locations.

BASEEFA certified intrinsically safe, Ex ib, for IIC, Zone 1, Temperature Class T6.

INSTRUMENT ACCESSORIES
(Also Refer to Figure Below)

Dilutor Kit Used to monitor inert atmospheres, or extend the concentration range of the instrument. The dilution ratios are adjustable 5 to 50 times. Specify Part Number 511745-1.

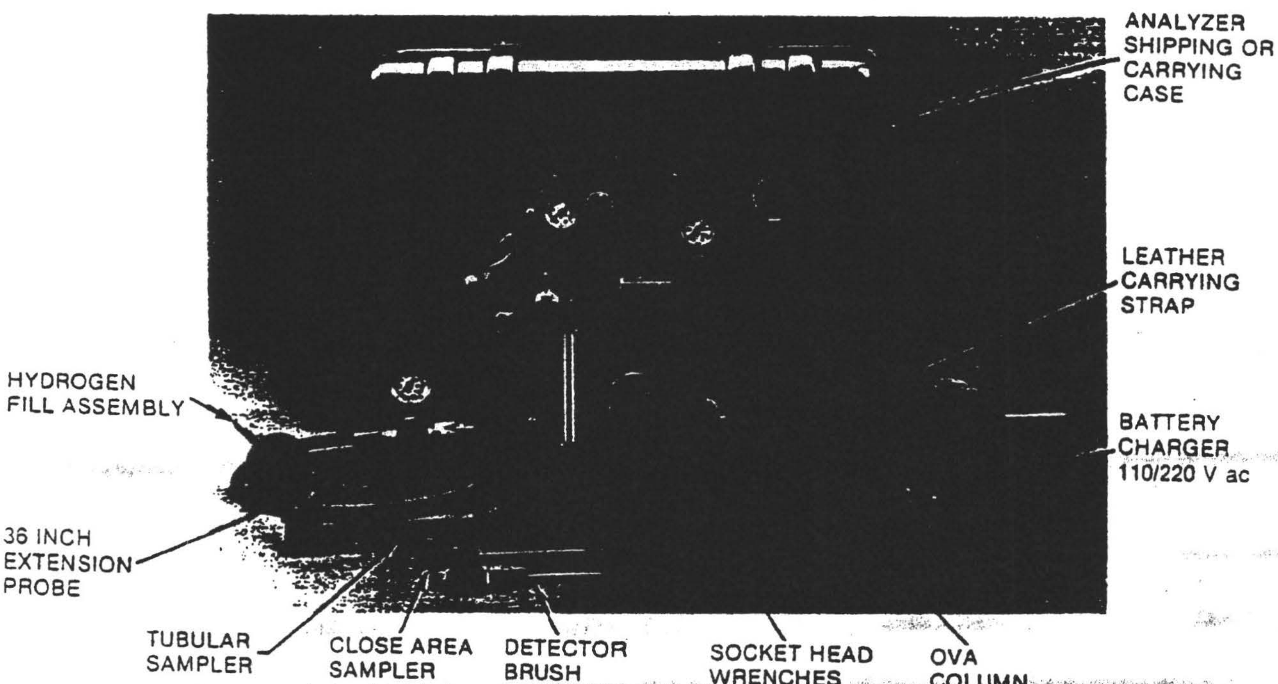
Portable Isothermal Kit (PIP Kit) Used for the temperature control of the OVA columns at 0, 40, and 100°C (32, 104, and 212°F). Specify Part Number 511800-1.

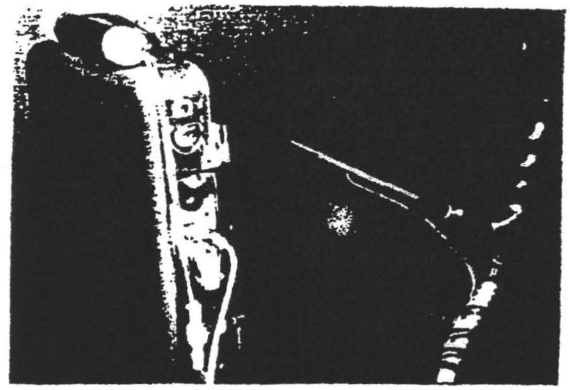
Standard Chromatographic Columns Various column packings available. Specify Part Number 510454, also type and length of column.

Portable Strip Chart Recorder Used for making hard copy records for both Option A and Option B configurations. Specify Part Number 510445-2 for FM certifications, and Part Number 510445-5 for BASEEFA certifications.

Septum Adapter Used for making syringe injections of gases into the instrument. Specify Part Number 510645-1.

Charcoal Filter Adapter Used for zeroing the instrument in contaminated environments. Specify Part Number 510095-1.





Dilutor Kit for CENTURY Organic Vapor Analyzers (OVA)

The Dilutor Kit, Part Number CR010MR, enables the owners of CENTURY Organic Vapor Analyzers to expand the dynamic range of the instrument by 10:1, 25:1, or 50:1. Each Dilutor Kit contains the following equipment:

- Dilutor Fittings
- 10:1 Dilutor Orifice — standard
  (25:1 and 50:1 Orifices are available)
- Charcoal Scrubber
- 1 cm Spacer
- Spiral Wrap
- Velcro Fasteners
- Valve Bracket
- Fine Metering Valve
- Tygon Tubing
- Disposable Charcoal Filters
- O-Rings
- Flexible 1 cm Spacer

A fine Hoke metering valve is employed to accurately control the amount of dilution (charcoal scrubbed air). The exact dilution setting can be recorded from the valve to assure a repeatable dilution.

Using the Dilutor Kit, it is now possible to easily measure samples in concentrations above the full scale of the meter, monitor inert atmospheres, zero the OVA in contaminated environments, and measure the extent of leaks in equipment from a fixed distance.

For further information, call (203) 853-1616, or write The Foxboro Company, Foxboro, MA 02035.

FOXBORO®

CERTIFIED CALIBRATION

EPA METHOD 21

COMPANY USPCI

INSTRUMENT S/N 41063

MODEL OVA-128

CALIBRATION GASES: (2)

10,000 ppm CH_4 in Air

Zero Air

	(3) Zero Reading (PPM)	Zero Drift (PPM)	Cal Reading (PPM)	Cal Drift (PPM)	Response Time (SEC)
1.	0.1	.1	9800	200	5
2.	0.2	.2	10,000	0	4
3.	0.1	.1	10,000	0	5

(1)Mean Value: Zero Drift: .13 ppm Cal Drift: 67 ppm

(5)Response Time: 5 seconds

(4)Calibration Precision = $\frac{\text{Mean Cal Drift} \quad 67}{10{,}000 \quad \text{Cal Gas Concentration}}$ X 100 = 0.67 %

(1) Absolute Value
(2) Calibration Gas Concentration
(3) Zero Reading Must Be Less Than 10ppm
(4) Calibration Precision must be ≤ 10% of Calibration Gas Concentration
(5) Response Time must be ≤ 30 seconds

Calibrated by Rudy Verzuh

Date 1/17/91

Appendix N-D.1 - Piping Component Data Sheets

TAG#	TANK#	EQUIPMENT DESCRIPTION	EQUIPMENT LOCATION	REQUIRED METHOD OF COMPLIANCE
M31	V1-T	V-1	TOP	
M31	V1	V-1	SIDES & BOTTOM	
M31		WASTE WATER	TANK TOP V-1	
M31A	V1-T	8" THIEF HATCH		A
M31B	V1-T	1" PORT, HIGH LEVEL ALARM		C
M31C	V1-T	12" PORT, FLANGE TO CONSERVATION		A
M31C	V1-T	VENT, FLANGE, RUPTURE DISC		C,E
M31D	V1-T	2" PORT, PLUG, SOUTH		C
M31E	V1-T	2 " PORT, PLUG, CNETER		C
M31F	V1-T	2" PORT, PLUG, NORTH		C
M31G	V1-T	1/2 PORT TO PRESSURE INDICATOR		C
M31H	V1	1" PORT, PLUG	TOP SOUTH SIDE	C
M31I	V1	24" MANWAY	BOTTOM WEST	A
M31I	V1	2" PORT, PIPE	BOTTOM EAST	C
M32	V2-T	V-2	TOP	
M32	V2-T	V-2	SIDES & BOTTOM	
M32		CHLOR RECYCLE SOLVENT	TANK TOP V-2	
M32A	V2-T	8" THIEF HATCH		A
M32B	V2-T	1" PORT, HIGH LEVEL ALARM		C
M32C	V2-T	12" PORT, FLANGE TO CONSERVATION		A,E
M32C	V2-T	VENT, FLANGE, RUPTURE DISC		C,E
M32D	V2-T	2" PORT, PLUG	TOP EAST EDGE	C
M32H	V2	2" PORT, PLUG	WEST SIDE FROM TOP	C
M32I	V2	3" PORT, PLUG		C
M32J	V2	24" MANWAY		A
M32K	V2	12" PORT, BLANK FLANGE		A
M32L	V2-B	2" PORT, PLUG	AT BOTTOM	C
M32M	V2-T	2" PORT, PLUG	EAST AT TOP	C
M32M	V2-B	2" PORT, PIPE TO	EAST AT BOTTOM	C
M32N	V2-B	2' X 3' MANWAY	BOTTOM SOUTH SIDE	A
M33	V3-T	V-3	TOP	
M33	V3-T	V-3	SIDES AND BOTTOM	
M-33		KILN FUEL TANK	TANK TOP V-3	
M33A	V3-T	8" THIEF HATCH		A
M33B	V3-T	1" PORT, HIGH LEVEL ALARM		C
M33C	V3-T	12" PORT, FLANGE, CONSERVATION VENT		C,E
M33C	V3-T	FLANGE, RUPTURE DISC		E
M33D	V3-T	2" PORT, 2"-1" REDUCER, 1" PLUG	EAST	C
M33E	V3-T	2" PORT, PLUG	CENTER	C
M33F	V3-T	2" PORT, PLUG	WEST	C
M33G	V3-T	1/2 PORT, TO PRESSURE INDICATOR		C
M33H	V3-T	1" PORT AND PLUG	EAST TOP	C
M33H	V3-B	2" PORT, PIPE	EAST BOTTOM	C
M33I	V3-B	24" MANWAY	SOUTH BOTTOM	A
M34	V4-T	V-4	TOP	
M34	V4-T	V-4	SIDES AND BOTTOM	
M34		KILN FUEL TANK	TANK TOP V-4	
M34A	V4-T	8" THIEF HATCH		A
M34B	V4-T	1" PORT, HIGH LEVEL ALARM		C
M34C	V4-T	12" PORT, FLANGE, CONSERVATION VENT		A,C,E
M34C	V4-T	FLANGE, RUPTURE DISC		E
M34D	V4-T	2" PORT, 2"-1" REDUCER, 1" PLUG	EAST	C
M34E	V4-T	2" PORT, PLUG	CENTER	C
M34F	V4-T	2" PORT, PLUG	WEST	C
M34H	V4-T	1" PLUG EAST	EAST TOP	C
M34I	V4-B	24" MANWAY	BOTTOM SOUTH	A
M35	V5-T	V-5	TOP	
M35	V5-T	V-5	SIDES AND BOTTOM	

M35		KILN FUEL TANK	TANK TOP V-5	
M35A	V5-T	8" THIEF HATCH		A
M35B	V5-T	1" PORT, HIGH LEVEL ALARM		C
M35C	V5-T	16" PORT TO FLANGE		E
M35C	V5-T	2" CONSERVATION VENT, RUPTURE DISC		E
M35D	V5-T	4" PORT, PLUG	SOUTHEDGE	C
M35E	V5-T	2" PORT, PLUG	SOUTH OF CENTER	C
M35F	V5-T	2" PORT, PLUG	CENTER	C
M35H	V5-T	3" PORT, PLUG IN WEST AT TOP		C
M35I	V5-T	3" PORT, PLUG IN WEST AT TOP	NORTH TOP	C
M35J	V5-B	2' X 3' MANWAY	NORTHWEST BOTTOM	A
M35K	V5-B	2" X 3' MANWAY	EAST BOTTOM	A
M36	V6-T	V-6		
M36	V6-T	V-6	SIDES AND BOTTOM	
M36		KILN FUEL TANK	TANK TOP V-6	
M36A	V6-T	8" THIEF HATCH		A
M36B	V6-T	1" PORT TO HIGH LEVEL ALARM		C
M36C	V6-T	16" PORT TO FLANGE		A
M36D	V6-T	4" PORT, PLUG		C
M36E	V6-T	2" PORT, PLUG	NORTH OF CENTER	C
M36F	V6-T	2" PORT, PLUG	CENTER	C
M36I	V6-B	2' X 3' MANWAY	NORTHWAY BOTTOM	A
M36I	V6-B	3" PORT, PIPE TO FLANGE	EAST BOTTOM	A
M37	V7-T	V-7		
M37	V7	V-7	SIDES	
M37		KILN FUEL TANK	TANK TOP V-7	
M37A	V7-T	8" THIEF HATCH		A
M37B	V7-T	1" PORT, HIGH LEVEL ALARM		C
M37C	V7-T	12" PORT, FLANGE TO CONSERVATION VENT		C,E
M37C	V7-T	FLANGE, RUPTURE DISC		E
M37D	V7-T	2" PORT, 2"-1" REDUCER, 1" PLUG	WEST OF CENTER	C
M37E	V7-T	2" PORT, PLUG	CENTER	C
M37F	V7-T	2" PORT, PLUG	EAST OF CENTER	C
M37H	V7-T	1' PORT, PLUG	TOP WEST	C
M37H	V7-B	24" MANWAY	NORTH BOTTOM	A
M38	V8-T	V-8		
M38	V8	V-8	SIDES	
M38		INCINERATION WASTE LIQUID	TANK TOP V-8	
M38A	V8-T	8" THIEF HATCH		A
M38B	V8-T	1" PORT, HIGH LEVEL ALARM		C
M38C	V8-T	12" PORT, FLANGE TO CONSERVATION VENT		A,E
M38C	V8-T	FLANGE, RUPTURE DISC		E
M38D	V8-T	2" PORT, 2"-1" REDUCER, 1" PLUG	WEST OF CENTER	C
M38E	V8-T	2" PORT, PLUG	CENTER	C
M38F	V8-T	2" PORT, PLUG	EAST OF CENTER	C
M38H	V8-T	1" PORT & PLUG	TOP WEST	C
M38I	V8-B	24" MANWAY	NORTH BOTTOM	A
P143	V5-B	3" PORT, PIPE, FLANGE	WEST BOTTOM	C,A
P143		3" VALVE (GATE - 150#)	TANK FARM K-15	A
P143A		3" FLANGE (150#)	TANK FARM K-15	A
P143B		3" FLANGE (150#)	TANK FARM K-15	A
P144	V5-T	3" PORT, PIPE, FLANGE	DOWN	C
P144		3" FLANGE (150#)	TANK FARM K-15	A
P145	V6-B	VALVE		A
P145		3" VALVE (GATE - 150#)	TANK FARM K-15	A
P145A		3" FLANGE (150#)	TANK FARM K-15	A
P145B		3" FLANGE (150#)	TANK FARM K-15	A
P146	V6-T	3" PORT, PIPE, FLANGE	DOWN	C
P146		3" FLANGE (150#)	TANK FARM K-15	A
P147		3" FLANGE (150#)	TANK FARM K-15	A
P148		3" FLANGE (150#)	TANK FARM K-15	A

P149		3" FLANGE (150#)	TANK FARM K-15	A
P150	V7-B	3" PORT, PIPE, VALVE	BOTTOM	A
P150		3" FLANGE (150#)	TANK FARM K-15	A
P151		3" VALVE (BALL SCREWED)	TANK FARM K-15	A
P152		1" VALVE (BALL SCREWED)	TANK FARM K-15	A
P153		3" HOSE CONNECTION	TANK FARM K-15	A
P154		1" VALVE (CHECK SCREWED)	TANK FARM K-15	A
P155		1" VALVE (BALL SCREWED)	TANK FARM K-15	A
P156		4" VALVE (BALL 150#)	TANK FARM K-15	A
P156A		4" FLANGE (150#)	TANK FARM K-15	A
P156B		4" FLANGE (150#) @ EXP. JNT.	TANK FARM K-15	A
P157		4" FLANGE (150#) @ PUMP	TANK FARM K-15	A
P158		2" HOSE CONNECTION	TANK FARM C-11	A
P159		2" VALVE (BALL SCREWED)	TANK FARM C-11	A
P159A		2' UNION	BEHIND NORTH M	A
P160		1/2" VALVE	BEHIND NORTH M	A
P160		1/2" VALVE (BALL SCREWED)	TANK FARM C-11	A
P161		1/2" VALVE (BALL SCREWED)	TANK FARM C-11	A
P162		2" HOSE CONNECTION	TANK FARM C-11	A
P163		2" VALVE (BALL SCREWED)	TANK FARM C-11	A
P207	V3-B	1/2" VALVE (BALL SCREWED)		C
P207		(CAP)	TANK FARM K-15	A
P208		2" VALVE (BALL SCREWED)	TANK FARM K-15	A
P208A		2" VALVE (BALL SCREWED)	BEHIND	A
P209		1/2" VALVE (BALL SCREWED)	TANK FARM K-15	A
P210		2" HOSE CONNECTION	TANK FARM K-15	A
P211		1" VALVE (BALL- SCREWED)	PROC AREA K-15	A
P212		2" TO 1" REDUCER, HOSE CONNECT	PROC AREA K-15	C,A
P213		1" VALVE (BALL - SCREWED)	PROC AREA K-15	A
P220	V8	3" HOSE CONNECTION	TANK FARM I-130	A
P221		1/2" VALVE (BALL SCREWED)	TANK FARM I-130	A
P222		3" VALVE (GATE- SCREWED)	TANK FARM I-130	A
P223		3" FLANGE (RAISED FACE)	TANK FARM I-130	A
P224U		3" FLANGE (RAISED FACE)	TANK FARM I-130	A
P225U		3" FLANGE (RAISED FACE)	TANK FARM I-130	A
P226	V7-B	2" PORT, PIPE	WEST BOTTOM	C
P226		2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P226A	V7	2" UNION		A
P227		2" CAP (SCREWED)	TANK FARM K-14	C
P228A		UNION	BEHIND	A
P228A		2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P229		1/2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P230		2" HOSE CONNECTION	TANK FARM K-14	A
P231	V1	3" VAVLE (GATE- SCREWED)	TANK FARM I-131	A
P232	V1	1/2" VALVE (BALL SCREWED)	TANK FARM I-131	A
P233	V1	3" HOSE CONNECTION	TANK FARM I-131	A
P234	V1	3" FLANGE (RAISED FACE)	TANK FARM I-131	A
P235	V1	2" COUPLING, PLUGGED	TANK FARM I-131	C
P236	V1	3" FLANGE (RAISED FACE)	TANK FARM I-131	A
P237	V1	3" FLANGE (RAISED FACE)	TANK FARM I-131	A
P238	V4-B	2" PORT, PIPE	BOTTOM WEST	C
P238		2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P238A	V4-B	T UP TO UNION		C
P239	V8-B	2" PORT, PIPE	BOTTOM WEST	C
P239		2" VALVE (BALL SCREWED)	TANK FARM I-147	A
P239A	V8-B	TO UNION	TANK FARM I-147	A
P239B	V8	2' UNION	TANK FARM I-147	A
P240U		2" CAP (SCREWED)	TANK FARM I-147	C
P241		2" VALVE (BALL SCREWED)	TANK FARM I-147	A
P241A		2" UNION	BEHIND	A
P241B		2" UNION		A

P242		2" HOSE CONNECTION	TANK FARM I-147	A
P243		1/2" VALVE (BALL SCREWED)	TANK FARM I-147	A
P244		1/2" DRAIN LINE (OPEN)	TANK FARM I-147	A
P247	V4-B	T TO 2"-1" REDUCER		C
P247	V4-B	1" PIPE		C
P247		1" VALVE (BALL - SCREWED)	TANK FARM K-14	A
P248	V4-B	TO ELBOW SOUTH, PLUG, THREADED	TANK FARM K-14	C
P249A		UNION	BEHIND	A
P249		2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P250		1/2" VALVE (BALL SCREWED)	TANK FARM K-14	A
P251		2" HOSE CONNECTION	TANK FARM K-14	A
P252		2" UNION (OPEN)	TANK FARM - 132	A
P253		2" VALVE (BALL SCREWED)	TANK FARM - 132	A
P254		1/2" VALVE (BALL SCREWED)	TANK FARM - 132	A
P255		2" HOSE CONNECTION	TANK FARM - 132	A
P259	V2-B	2" PORT, PIPE	NORTHWEST .	
P259	V2-B	TO ELBOW UP, PIPE		
P259	V2-B	2" VALVE (BALL SCREWED)	TANK FARM C-14	C
P259A	V2-B	TO UNION	TANK FARM C-14	C
P260		1/2" VALVE	TANK FARM C-14	A
P261		2" VALVE (BALL SCREWED)	TANK FARM C-14	A
P262		2" HOSE CONNECTION	TANK FARM C-14	A
P262A		UNION	TANK FARM C-14	A
P262B		UNION	TANK FARM C-14	A
P268		3" PORT, PIPE, VALVE	BOTTOM VALVE	A
P263	V8-B	2" HOSE CONNECTION	TANK FARM W-1	A
P263A	V1	UNION	BEHIND	C
P264		1/2" VALVE (BALLSCREWED)	TANK FARM W-1	A
P265		2" VALVE (BALL SCREWED)	TANK FARM W-1	A
P266		TO FLANGE, TO BALL VALVE, TO FLANGE		A
P266	V1-B	3" VALVE (PLUG - 150# FLNGD)	TANK FARM W-1	A
P268		3" VALVE (PLUG - 150# FLNGD)	TANK FARM W-143	C
P270	V1	TO VALVE, PIPE, TO ELBOW UP,PIPE		A
P270	V1	2" VALVE (BALL SCREWED)	TANK FARM W-1	A
P270A		TO UNION		C
P270A	V1	3" PORT, PIPE TO	BOTTOM VALVE	A
P271	V1	VALVE, PIPE		A
P271	V2	2" VALVE (BALL SCREWED)	TANK FARM C-14	C
P272		TO QUICK CONNECT		C
P272	V2	2" HOSE CONNECTION	TANK FARM C-14	A
P273		2" PORT, PIEP, VALVE, PIEP	SOUTHEWEST BOTTOM	
P273	V5-B	TO ELBOW UP, PIPE		A
P273	V5-B	2" VALVE (BALL SCREWED)	TANK FARM K-13	C
P273A		TO UNION		C
P274	V5-B	2" HOSE CONNECTION	TANK FARM K-13	A
P275		2" PORT, PIPE, VALVE TO	SOUTHEAST BOTTOM	A
P275	V6-B	ELBOW PIPE TO		A
P275	V6-B	2" VALVE (BALL SCREWED)	TANK FARM K-13	C
P275A		UNION		C
P276	V6-B	2" HOSE CONNECTION	TANK FARM K-134	A
P277		3" PORT, PIPE, GLANGE	FLEXLINK TO P278	A
P277	V6-B	FLANGE (150#)	TANK FARM K-14	
P278		3" PORT, PIPE, FLANGE	FLEXLINK TO P277	C
P278	V6-B	FLANGE (150#)	TANK FARM K-14	A
P308		1/2 ELL (OPEN)	TANK FARM K-15	C
P323		2" VALVE (BALL SCREWED)	TANK FARM K-17	A
P324		2" VALVE	PUMP STATION LINE	A
P324		1/2" VALVE (BALLSCREWED)	TANK FARM K-17	A
P325		1/2 VALVE	PUMP STATION LINE 4	
P325		2" HOSE CONNECTION	TANK FARM K-17	A
P325A		2" UNION	PUMP STATION LINE	

P326		2" VALVE (BALL SCREWED)	PROC AREA K-17	A
P327		1/2" VALVE (BALLSCREWED)	PROC AREA K-17	A
P328		2" HOSE CONNECTION	PROC AREA K-17	A
P330		2" VALVE	PUMP STATION LINE	
P330		2" VALVE (BALL SCREWED)	TANK FARM K-17	A
P330A		2" UNION	PUMP STATION LINE	A
O331		1/2" VALVE	PUMP STATION LINE	A
P331		1/2" VALVE (BALL SCREWED)	TANK FARM K-17	A
P332		2" QUICK CONNECT	PUMP STATION LINE	
P332		2" HOSE CONNECTION	TANK FARM K-17	A
P333		2" VALVE (BALL SCREWED)	PROC AREA K-17	A
P334		1/2" VALVE (BALL SCREWED)	PROC AREA K-17	A
P334A		2" QUICK CONNECT	PUMP STATION LINE	
P335		2" HOSE CONNECTION	PROC AREA K-17	A
P337		2" VALVE (BALL SCREWED)	PUMP STATION LINE	
P337		2" VALVE (BALL SCREWED)	TANK FARM K-17	A
P334B		2" VALVE (BALL SCREWED)	PUMP STATION K-17	A
P337A		2" UNION	PUMP STATION K-17	A
P334C		2" UNION	PUMP STATION K-17	A
P338		1/2" VALVE	PUMP STATION K-17	A
P334D		1/2" VALVE	PUMP STATION K-17	A
P339		2" QUICK CONNECT	PUMP STATION LINE	
P340		2" VALVE (BALL SCREWED)	PROC AREA K-17	A
P341		1/2" VALVE (BALL SCREWED)	PROC AREA K-17	A
P342		2" HOSE CONNECTION	PROC AREA K-17	A
P345		4" FLANGE	PROC AREA K-18	A
P346		4" VALVE (BALL SCREWED)	PROC AREA K-18	A
P347		4" FLANGE	PROC AREA K-18	A
P348		6" VALVE (PLUG - 150#)	PROC AREA K-18	A
P349		6" FLANGE (150# SLIP ON)	PROC AREA K-18	A
P350		6" FLANGE (150# SLIP ON)	PROC AREA K-18	A
P351		6" FLANGE (150# SLIP ON)	PROC AREA K-18	A
P352		6" FLANGE (150# STRAINER)	PROC AREA K-18	A
P353		4" FLANGE (150# PUMP NOZZLE)	PROC AREA K-18	A
P354		4" VALVE (BALL SCREWED)	PROC AREA K-18	A
P355		4" FLANGE (150# PUMP NOZZLE)	PROC AREA K-15	A
P356		4" VALVE (BALL SCREWED)	PROC AREA K-15	A
P358		1" VALVE (BALL SCREWED)	PROC AREA K-15	A
P359		1" VALVE (BALL SCREWED)	PROC AREA K-18	A
P39	V5-B	TO VALVE		A
P408	V6-B	4" PORT, FLANGE TO	BOTTOM VALVE	A
P409	V5-B	4" PORT, PIPE TO FLANGE	BOTTOM VALVE	A
P55	V6-B	4" VALVE (BALL SCREWED)		A
P56	V4-B	3" PORT, PIPE, FLANGE	BOTTOM VALVE	A
P64	V3-B	3" PORT, PIPE, FLANGE	BOTTOM VALVE	A
P64	V3-B	VALVE, FLANGE		

~~Appendix N-E - Equipment Designated As No Detectable Emissions~~

Deleted

Appendix N-F - Monitoring Results and Repair Reports

RCRA VOC EQUIPMENT LDAR PROGRAM – FIELD LEAK MONITORING RECORD (40 CFR 265 SUBPART BB)

FACILITY: Wichita HRS USEPA ID NUMBER: KSD007246846 Date: 12/15/90

Instrument Operator: D. Wilcox Calibration Gas ID#: lot 31995 Daily Calibration Check: 10,000 ppm CH_4

Instrument ID#: 20859 Inspector's Name: Ron [illegible] Inspector's Signature: [illegible]

Pipeline/Process ID: K 153 (Process Area) Type of Material Service: Kiln Fuel

DESCRIPTION	TAG NUMBER	EQUIPEMENT/CONNECTION CONDITION DESCRIPTION	OVA READING
3" Ball Valve near middle process unit	P123		<10 ppm
2" Ball Valve near middle process unit	P 124		15 ppm
2" Ball Valve near middle process unit	P 126		<10 ppm
2" Hose Connection near middle unit	P 127	Connected	
3" Plug Valve off middle unit	P 128		<10 ppm
2" Hose Connection near middle unit	P 125	Connected	
4" Ball Valve at Process Area manifold	P 136		<10 ppm
1/2" = = = = = =	P 137		<10 ppm
4" Hose Connection at Process Manifold	P 138	Capped	<10 ppm

Comments (Weather, Dilutor Cal.)

Background Measurements: #1 #2 #3 #4 #5

RCRA VOC EQUIPMENT LDAR PROGRAM – FIELD LEAK MONITORING RECORD (40 CFR 265 SUBPART BB)

FACILITY: HBE-WICHITA USEPA ID NUMBER: KSD007246846 Date: 12/15/10

Instrument Operator: D. Coker Calibration Gas ID#: LOT 31995 Daily Calibration Check: 10,000 ppm Methane

Instrument ID#: 20859 Inspector's Name: Ron Robertson Inspector's Signature: [signature]

Pipeline/Process ID: C115 Type of Material Service: CHLORINATED ORGANIC LIQUIDS/

DESCRIPTION	TAG NUMBER	EQUIPEMENT/CONNECTION CONDITION DESCRIPTION	OVA READING
2" BALL VALVE PAH MAN.	P-92		15 ppm
1/2" Ball Valve AT DH MAN.	P-93		<10 ppm
2" Hose Connection AT DA MAN	P-94	CAPPED	<10 ppm
2" Ball Valve AT MAN.	P-95		<10 ppm
1/2" Ball Valve AT TM.	P-96		<10 ppm
2" Hose Connection AT TM.	P-97		<10 ppm

Comments (Weather, Dilutor Cal.)

Background Measurements: #1 #2 #3. #4 #5

SITE/FACILITY ________

NOTICE !

THIS IS A 5 AND 15 DAY TIME LIMIT REPAIR ORDER

Initial Date	Mandatory 5–Day Action	Mandatory 15–Day Action
DATE: 12/17/90	12/22/90	01/01/91

VALVES: (40 CFR 265.1057)
5-Day: Tightening or replacing bonnet bolts, tightening packing gland nuts, or injecting lubricant into the lubricated packing.
15-Day: Leak source must be repaired such that it passes next monitoring event emission level of 10,000 ppm.

PUMPS: (40 CFR 265.1052)
5-Day: Tightening or replacing casing bolts, tightening packing gland bolts.
15-Day: Leak source must be repaired such that it passes next monitoring event emission level of 10,000 ppm or taken out of service.

CONNECTIONS: (40 CFR 265.1058)
5-Day: Tightening flange bolts.
15-Day: Leak source must be repaired such that it passes next monitoring event emission level of 10,000 ppm.

PRESSURE RELIEF DEVICES: (40 CFR 265.1054)
15-Day: Leak source must be repaired such that it passes next monitoring event emission level of 500 ppm.

OPEN ENDED LINES: (40 CFR 265.1058)
5-Day: Replacement of plug, blind flange, or closure of second block valve with drain.

ITEM	DATE PERFORMED 5–DAY	DATE PERFORMED 15–DAY	INITIALS OF PERSON PERFORMING REPAIR
1" BALL VALVE AT TRUCK BAY-LINE K153, NEEDS	12/20/90		RR
PLUG. (P-152)	12/20/90		RR
1" BALL VALVE AT TRUCK BAY-LINE K153 NEEDS	12/20/90		RR
PLUG. (P-155)	12/20/90		RR
OPEN ENDED 1/2" BALL VALVE (P-81) AT TRUCK MANIFOLD NEEDS PLUG.	12/20/90		RR
2" GATE VALVE AT (P-34) DRYER TANK NEEDS PLUG.	12/20/90		RR
1" HOSE CONNECTION AT DRYER TANK NEEDS PLUG. (P-34)	12/20/90		RR
1" ELBOW OPEN ENDED (P-31) NEEDS PLUG.	12/20/90		RR
1" HOSE CONNECTION (P-29) NEEDS PLUG AT DRYER TANK.	12/20/90		RR
2" HOSE CONNECTION NEEDS PLUG AT DRYER TANK.	12/20/90		RR
1/2" BALL VALVE (P-17) NEEDS PLUG.	12/20/90		RR

CC: Plant/Operations Manager, Director of Operations, Maintanence Supervisor, Environmental Compliance Dept., 40 CFR 265.1035 File

CERTIFIED CALIBRATION

EPA METHOD 21

COMPANY USPCI

INSTRUMENT S/N 41063

MODEL OVA 128

CALIBRATION GASES: (2)

10,000 PPM CH_4 in Air

100 PPM CH_4 in Air

	(3) Zero Reading (PPM)	Zero Drift (PPM)	Cal Reading (PPM)	Cal Drift (PPM)	Response Time (SEC)
1.	0.0	.1	95	2	3
2.	0.0	0	10,000	100	3
3.	0.0	.2	9960	60	4

(1)Mean Value: Zero Drift: .1 ppm Cal Drift: 54 ppm

(5)Response Time: 3 seconds

$$\text{(4)Calibration Precision} = \frac{\text{Mean Cal Drift}}{\text{Cal Gas Concentration}} \times 100 = .54\%$$

(1) Absolute Value
(2) Calibration Gas Concentration
(3) Zero Reading Must Be Less Than 10ppm
(4) Calibration Precision must be ≤ 10% of Calibration Gas Concentration
(5) Response Time must be ≤ 30 seconds

Calibrated by R Robert

Date 9-30-91

Table of Contents

List of Acronyms

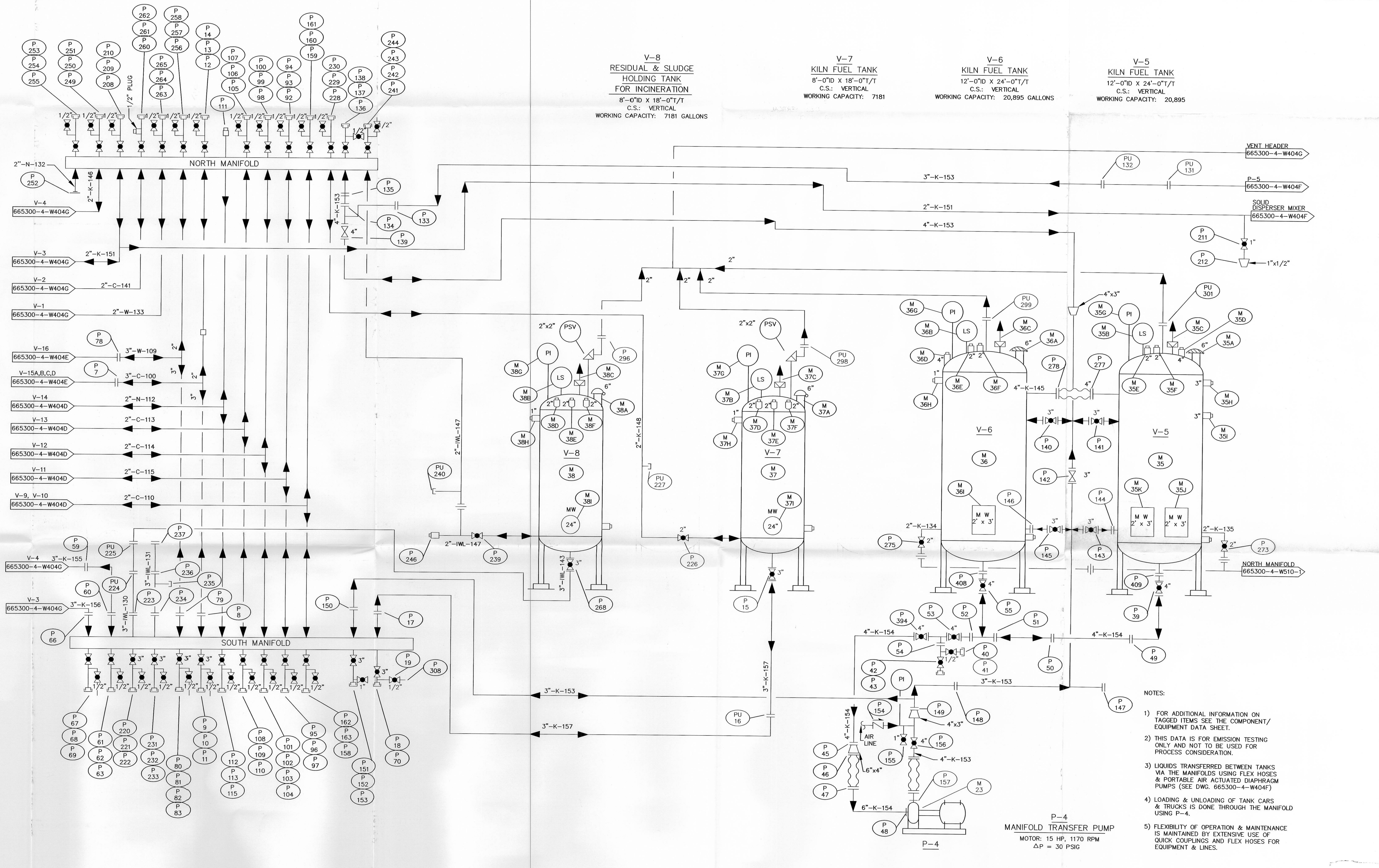
Clean Harbors Kansas, LLC (SKW)

Y-1 Introduction:

This section referenced Drawings, of the Clean Harbors Kansas, LLC RCRA permit application is provided to facilitate location of information regarding site layout, equipment, and processing unit information. Reduced versions of these drawing are included as figures within the text or appendices of the application where applicable.

Clean Harbors Kansas, LLC
RCRA Permit Application
Section Y
Referenced Drawings

List of Drawings



NOTES:

1) FOR ADDITIONAL INFORMATION ON TAGGED ITEMS SEE THE COMPONENT/ EQUIPMENT DATA SHEET.

2) THIS DATA IS FOR EMISSION TESTING ONLY AND NOT TO BE USED FOR PROCESS CONSIDERATION.

3) LIQUIDS TRANSFERRED BETWEEN TANKS VIA THE MANIFOLDS USING FLEX HOSES & PORTABLE AIR ACTUATED DIAPHRAGM PUMPS (SEE DWG. 665300-4-W404F)

4) LOADING & UNLOADING OF TANK CARS & TRUCKS IS DONE THROUGH THE MANIFOLD USING P-4.

5) FLEXIBILITY OF OPERATION & MAINTENANCE IS MAINTAINED BY EXTENSIVE USE OF QUICK COUPLINGS AND FLEX HOSES FOR EQUIPMENT & LINES.

FIGURE 202

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	6/10/11	
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

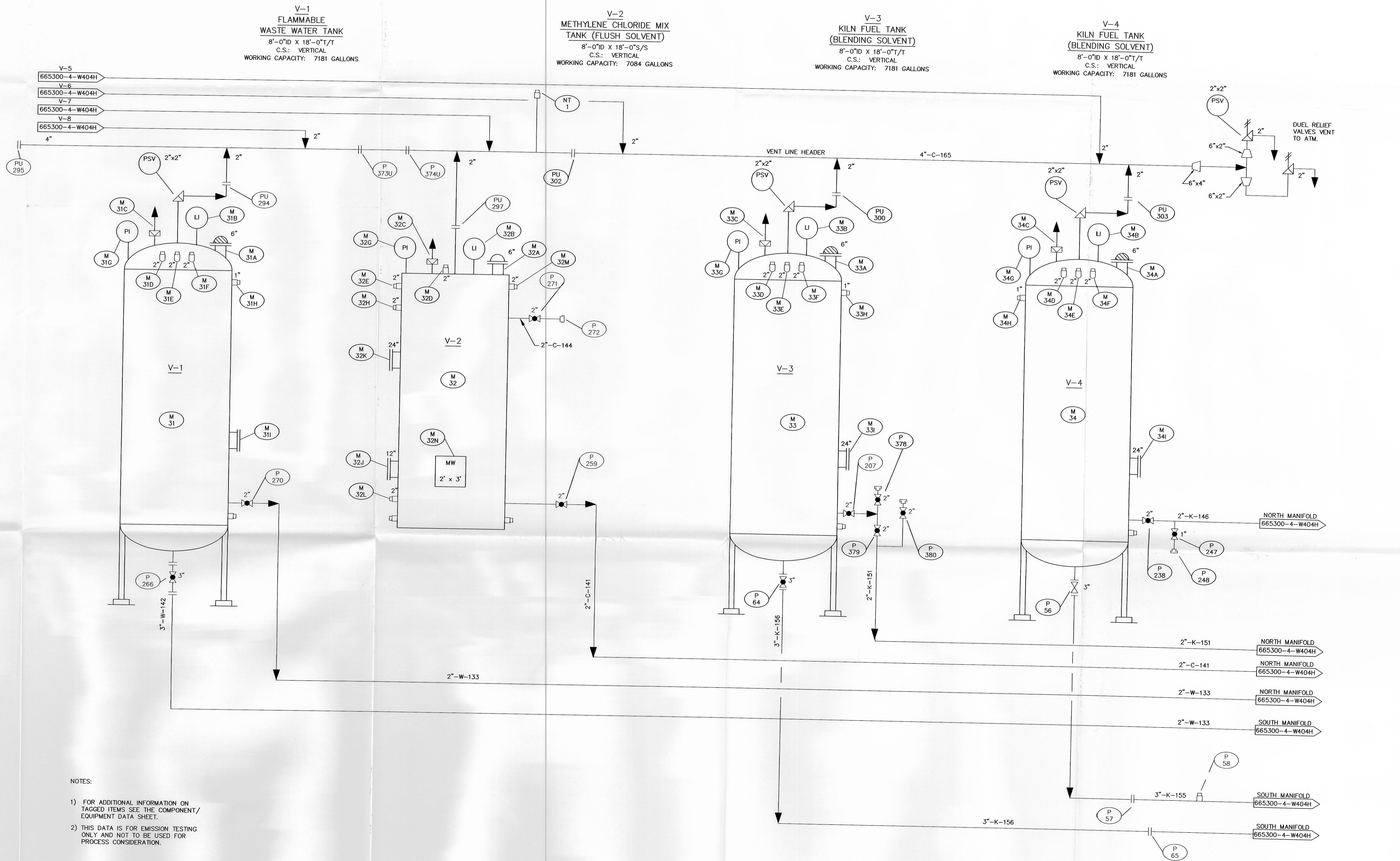
CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	NONE	06/17/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
PIPING & INSTRUMENTATION DIAGRAM
TANK FARM 2/V-5 , V-6, V-7 & V-8

DRAWING NO. P&ID-W404H

REV. B



NOTES:

1) FOR ADDITIONAL INFORMATION ON TAGGED ITEMS SEE THE COMPONENT/ EQUIPMENT DATA SHEET.

2) THIS DATA IS FOR EMISSION TESTING ONLY AND NOT TO BE USED FOR PROCESS CONSIDERATION.

FIGURE 201

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	6/10/11	
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

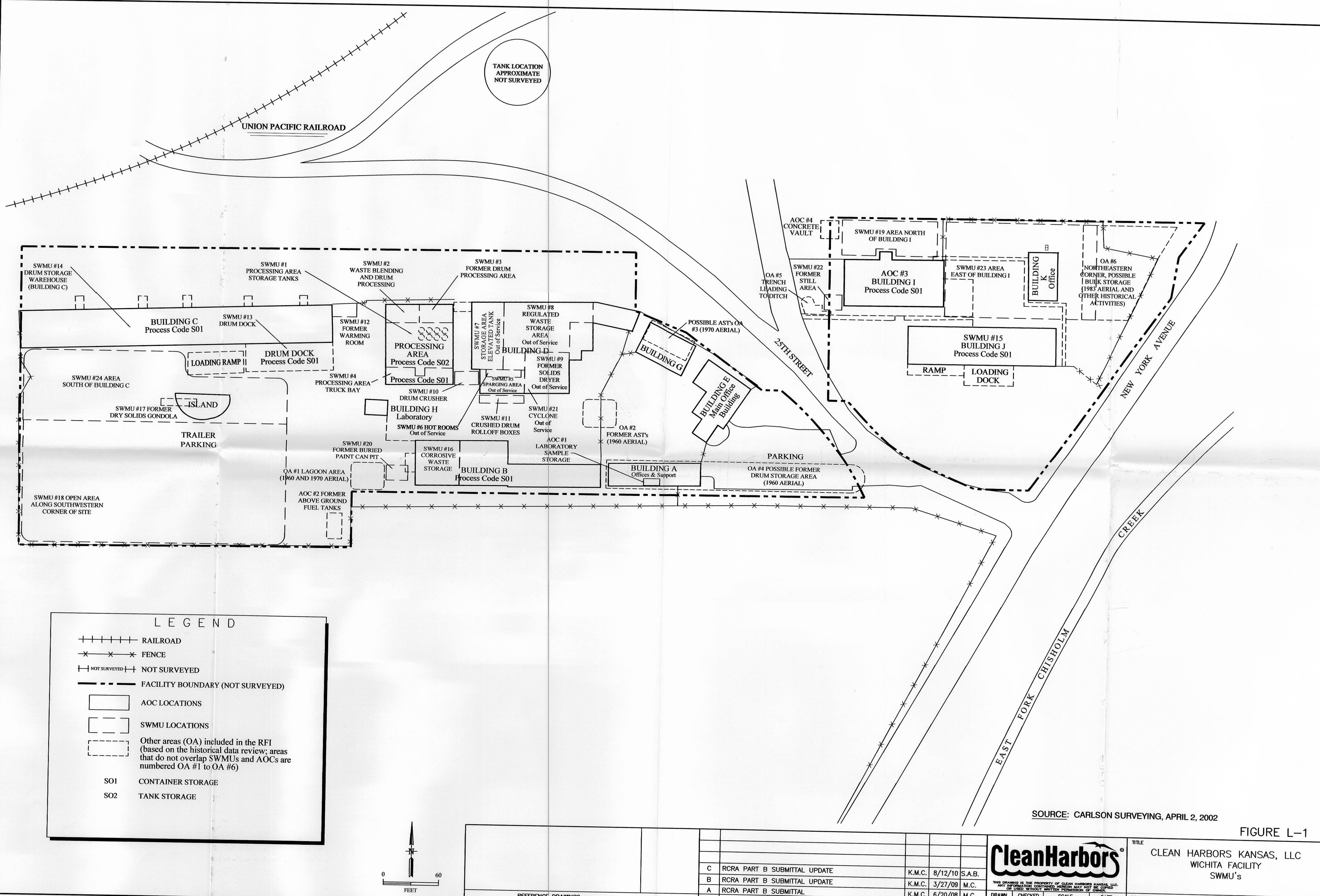
CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	NONE	06/17/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
PIPING & INSTRUMENTATION DIAGRAM
TANK FARM I/V-1, V-2, V-3 & V-4

DRAWING NO. P&ID-W404G

REV. B



SOURCE: CARLSON SURVEYING, APRIL 2, 2002

FIGURE L-1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	8/12/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

CleanHarbors

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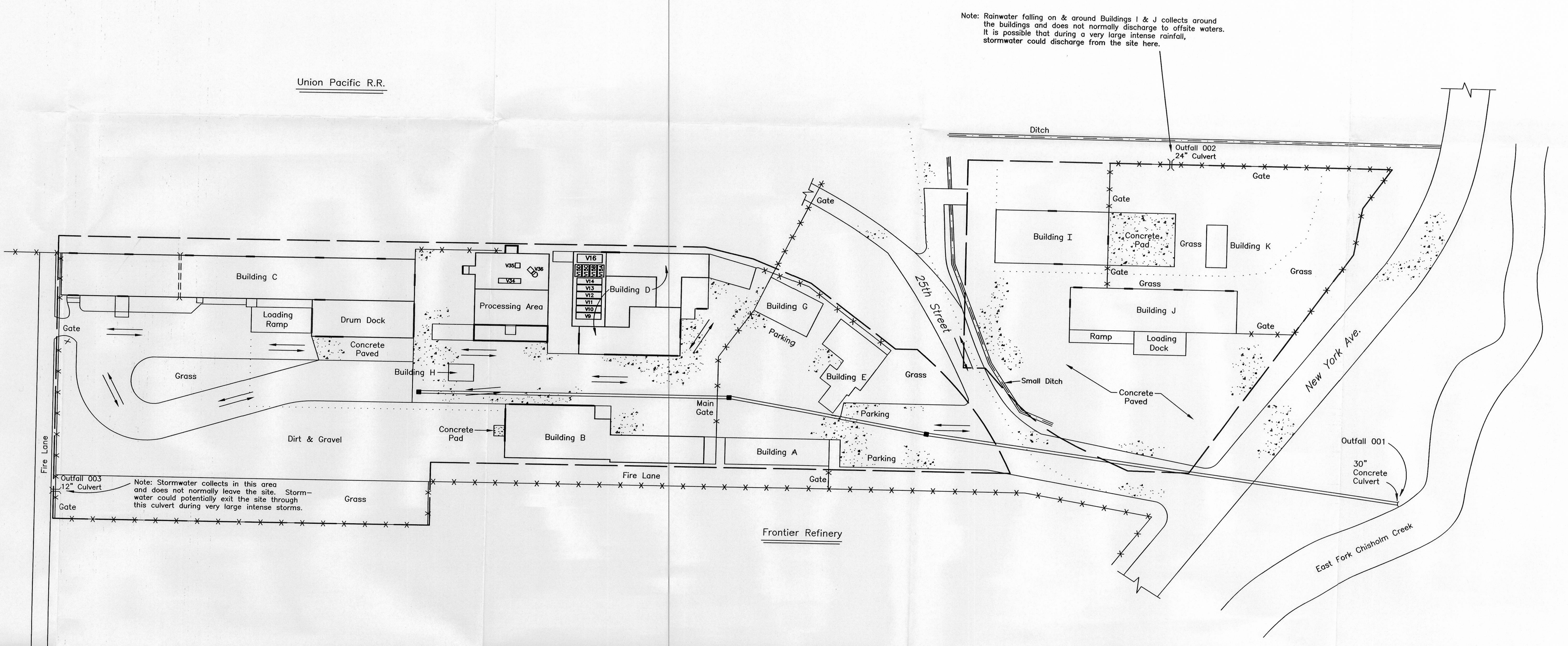
TITLE: CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
SWMU's

DRAWN	CHECKED	SCALE	DATE	DRAWING NO.	REV.
K.M.C.	M.C.	AS NOTED	06/18/08	SWMU	C

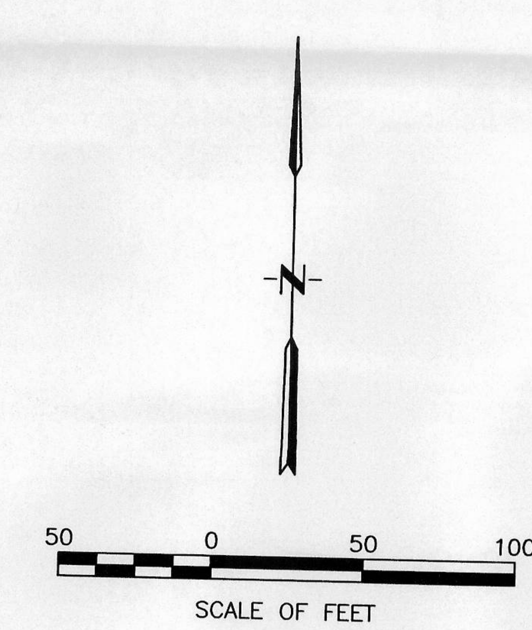


Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes



Notes:

1. TANKS & MISCELLANEOUS UNIT LOCATIONS SUBJECT TO CLOSURE ARE IDENTIFIED IN THE PROCESSING AREA AND BUILDING D.
2. CONTAINER MANAGEMENT UNITS SUBJECT TO CLOSURE INCLUDE:
   - BUILDING B
   - BUILDING D
   - BUILDING J

FIGURE J–3

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	6/25/12	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
A	RCRA PART B SUBMITTAL	K.M.C.	3/27/09	M.C.

REFERENCE DRAWINGS

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	03/24/09

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
HAZARDOUS WASTE MANAGEMENT AREAS

DRAWING NO. HWMA
REV. C

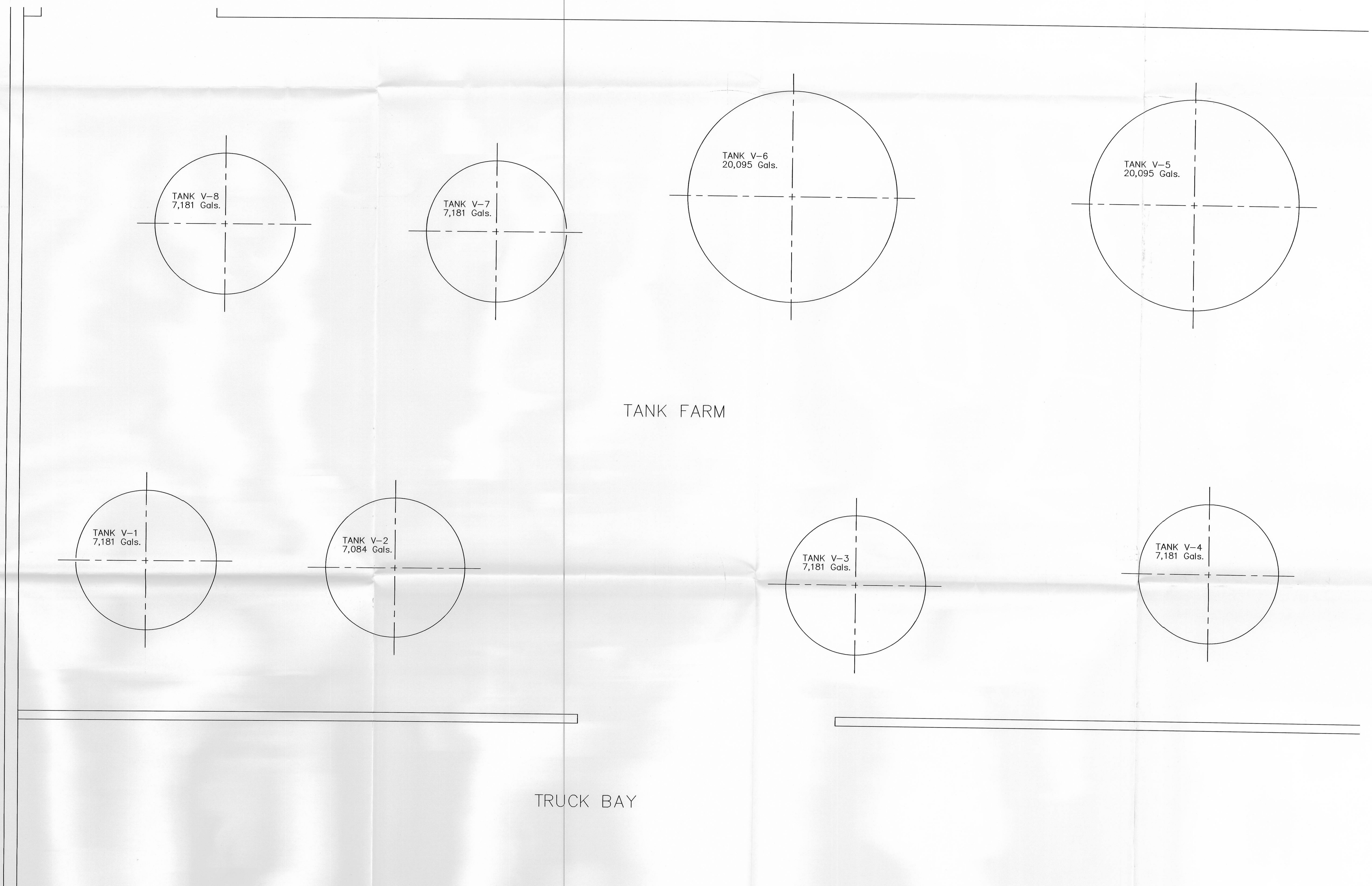


FIGURE J-2

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	3/8"=1'-0"	06/17/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
TANK FARM1/2 TANK LOCATIONS

DRAWING NO.	REV.
TKFRM1/2-W511-1	A

Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Container Storage Area
- : Container and Tank Storage Area
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes

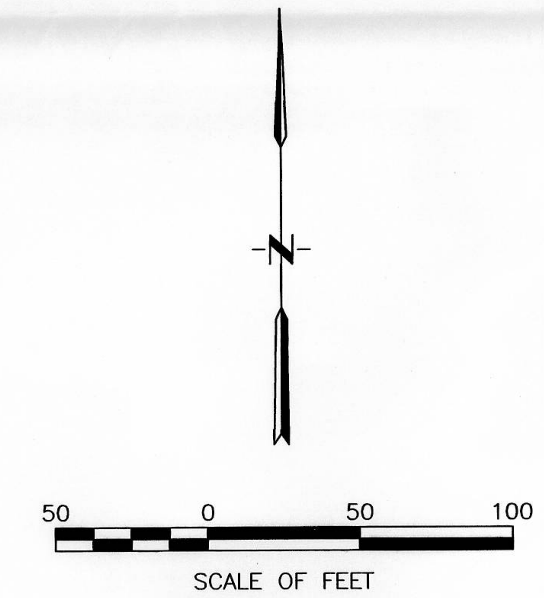


FIGURE J–1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

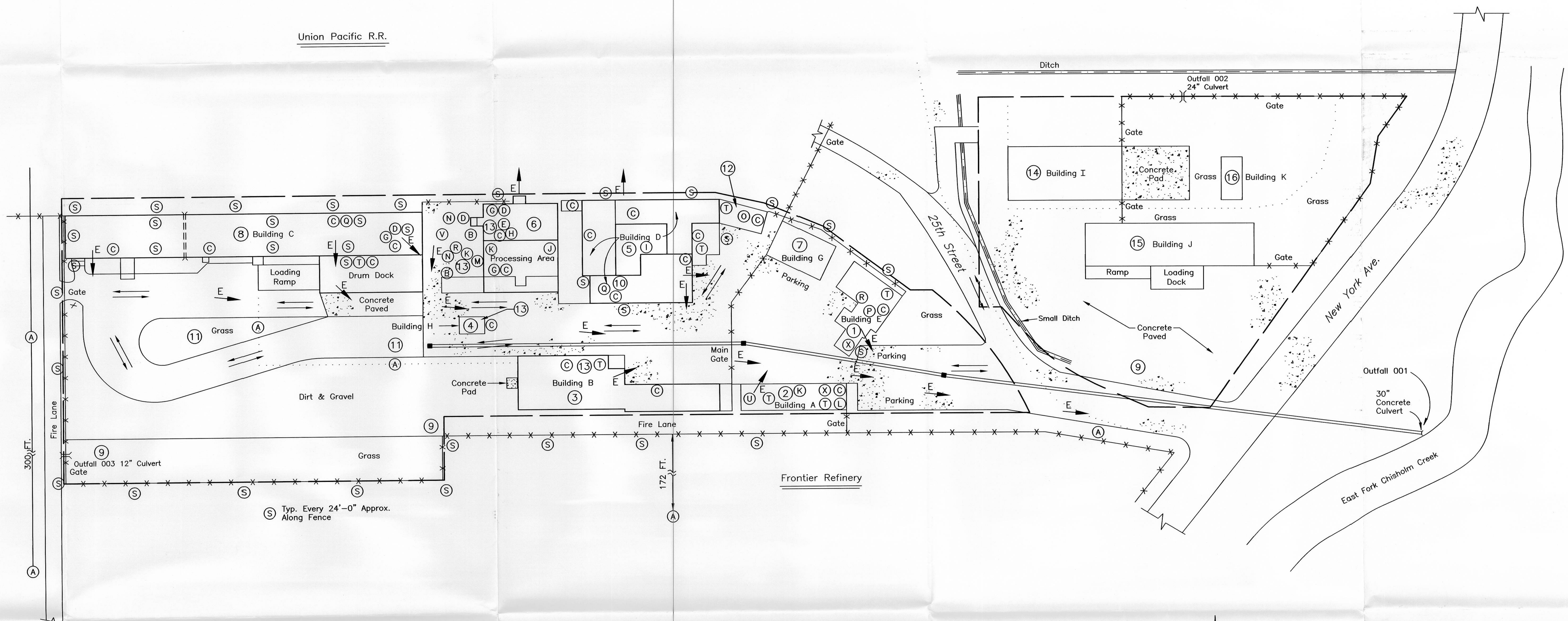
CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
HAZARDOUS WASTE MANAGEMENT AREAS

DRAWING NO. HWMA

REV. C



Emergency Equipment Legend:

- (A) Fire Hydrant
- (B) Portable 150 Lb. Fire Extinguisher
- (C) Hand-Held Fire Extinguisher
- (D) Emergency Alarm
- (E) Shovel
- (F) Portable P.A. System
- (G) Oil Absorbant
- (H) Empty Drums
- (I) Air Compressor
- (J) Flexible Hose & Quick Cplgs.
- (K) Shower & Eye Wash
- (L) Goggles & Face Shields
- (M) Organic Vapor Masks, SCBA, Body Harness
- (N) Protective Clothes & Boots
- (O) Portable Sump Pump
- (P) First Aid Kit
- (Q) Squeegee
- (R) Hardhats
- (S) No Smoking/Danger Signs
- (T) Telephone
- (U) Foam Equipment
- (V) Vehicles
- (W) Oxygen
- (X) Fire Blanket
- E Evacuation Route

Building Legend:

1. Administration Offices, Building 'E'
2. Lab/Admin., Building 'A'
3. Building 'B'
4. Operations Office, Building 'H'
5. Building 'D'
6. Process Area
7. Break Room, Building 'G'
8. Hazardous Waste Management, Building 'C'
9. Monitoring Wells
10. Sparging/Hot Room Area
11. Remote Sprinkler Tie In
12. Maintenance
13. Emergency Showers
14. Hazardous Waste Management, Building 'I'
15. Building 'J'
16. Offices, Building 'K'

N

50 0 50 100
SCALE OF FEET

Legend:

- Railroad Tracks
- Fence
- Property Line
- Secondary Containment Berm or Wall
- Pavement
- Drainage Boundary
- Storm Drain Catch Basins
- Underground Storm Sewer Line
- Truck Routes

FIGURE H-1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

CleanHarbors

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	05/16/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
EMERGENCY EQUIPMENT/EVACUATION ROUTES PLAN

DRAWING NO. WICHFIRE
REV. C

Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

: Railroad Tracks
: Fence
: Property Line
: Container Storage Area
: Container and Tank Storage Area
: Loading and Unloading Area
: Secondary Containment Berm or Wall
: Pavement
: Drainage Boundary
: Storm Drain Catch Basins
: Underground Storm Sewer Line
: Truck Routes

N

50 0 50 100

SCALE OF FEET

FIGURE G-1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

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DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
SITE PLAN

DRAWING NO. WICHSITE

REV. C

NOTES:
1. 3,000 psi CONCRETE.
2. No. 4 REBAR ON 24" CENTERS.
3. RAMPS FURNISHED AND INSTALLED BY HRI.
4. CONCRETE TO BE SANDBLASTED WHERE EPOXY BONDING GOES.

FIGURE E-2

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	7/1/08	M.C.

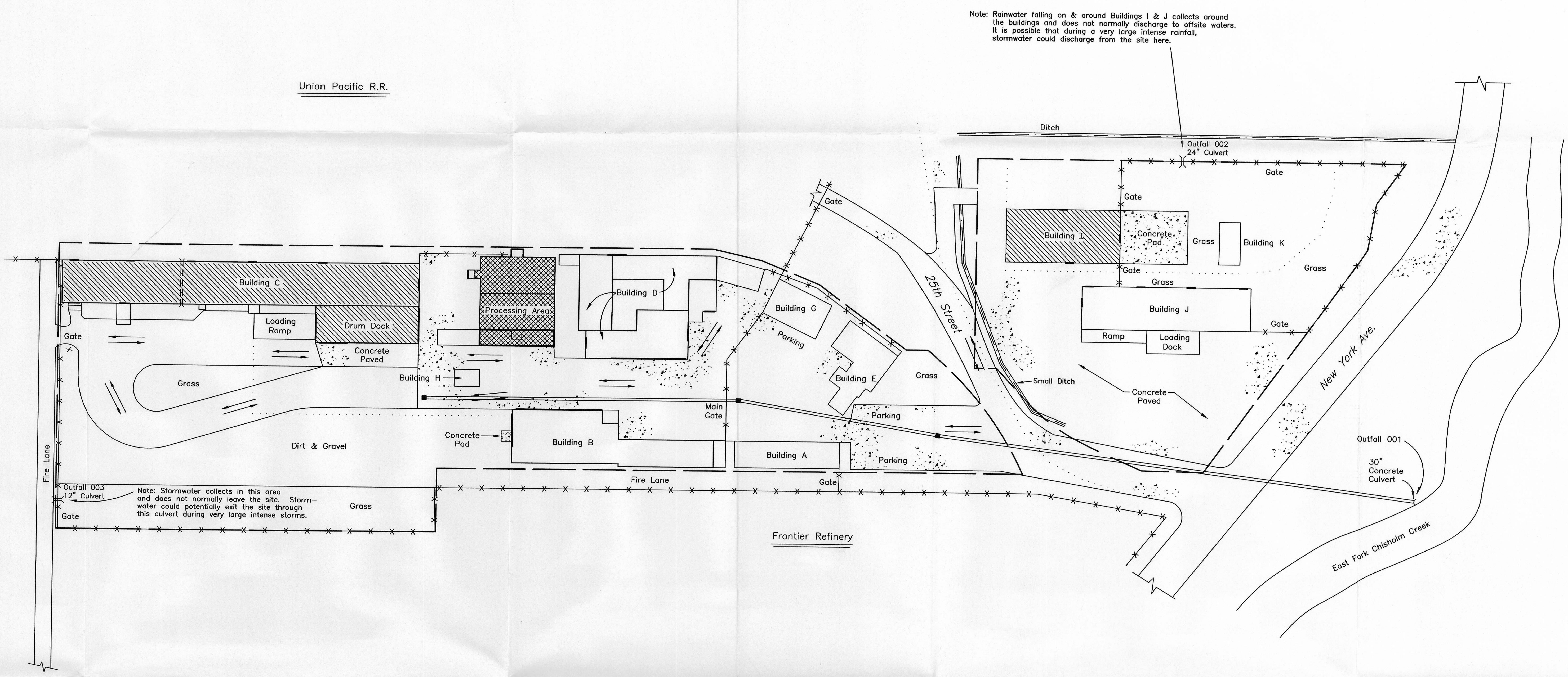
REFERENCE DRAWINGS

CleanHarbors

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	3/16"=1'-0"	07/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
PROCESS BUILDING

DRAWING NO. P 100/P 200
REV. A



Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

: Railroad Tracks
: Fence
: Property Line
: Container Storage Area
: Container and Tank Storage Area
: Loading and Unloading Area
: Secondary Containment Berm or Wall
: Pavement
: Drainage Boundary
: Storm Drain Catch Basins
: Underground Storm Sewer Line
: Truck Routes

FIGURE E–1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
HAZARDOUS WASTE MANAGEMENT AREAS

DRAWING NO. HWMA
REV. C

AREA	H	X1	X2
I 100	5 1/2"	1'-2"	1-10"
I 300	4"	1'-4"	1'-8"

SECTION A-A
TYPICAL DIKE CROSS SECTION
SCALE: 1"=1'-0"

SECTION B-B
TYPICAL RAMP CROSS SECTION
SCALE: 1 1/2"=1'-0"

SECTION C-C
TYPICAL DIKE CROSS SECTION
SCALE: 3"=1'-0"

NOTES:
1. 3,000 psi CONCRETE.
2. No. 4 REBAR ON 24" CENTERS.
3. CONCRETE TO BE SANDBLASTED WHERE EPOXY BONDING GOES.

SECTION D-D
CONCRETE ENTRY PEDESTAL CROSS SECTION
SCALE: 1/2"=1'-0"

FIGURE D-6

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	6/7/11	S.A.B.

REFERENCE DRAWINGS

CleanHarbors

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
BUILDING I - DIKING AND RAMPS

DRAWN	CHECKED	SCALE	DATE	DRAWING NO.	REV.
K.M.C.		1/4"=1'-0"	05/24/11	67WA-0200-500	A

FIGURE D-5

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	7/1/08	M.C.

REFERENCE DRAWINGS

CleanHarbors

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	1/4"=1'-0"	06/30/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
DRUM DOCK – DIKING AND RAMPS

DRAWING NO. L 100

REV. A

FIGURE D-4

REFERENCE DRAWINGS	REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
	A	RCRA PART B SUBMITTAL	K.M.C.	6/30/08	M.C.

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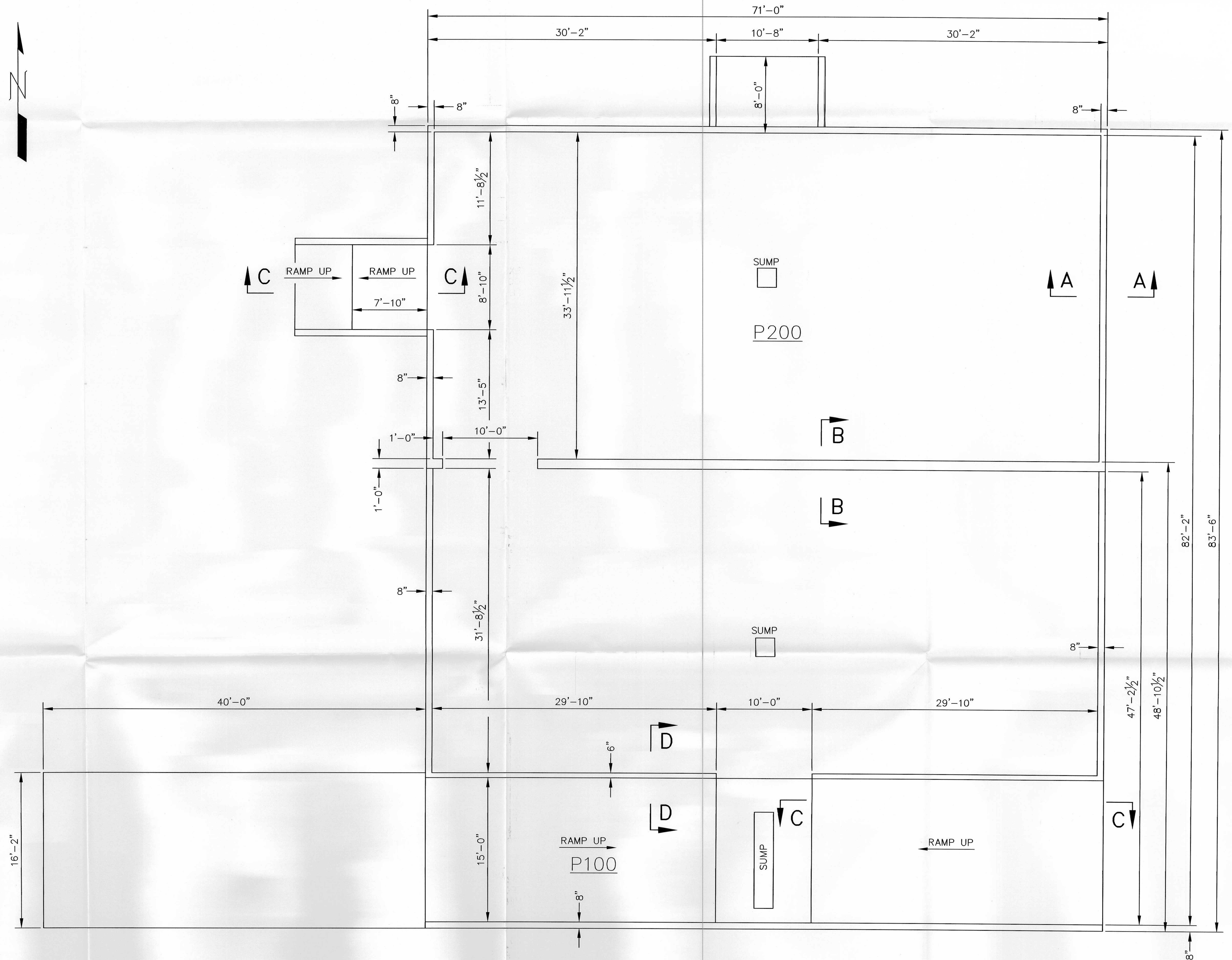
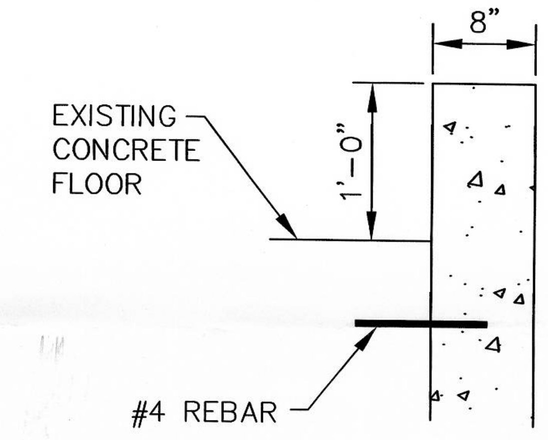
DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	1/8"=1'-0"	06/27/08

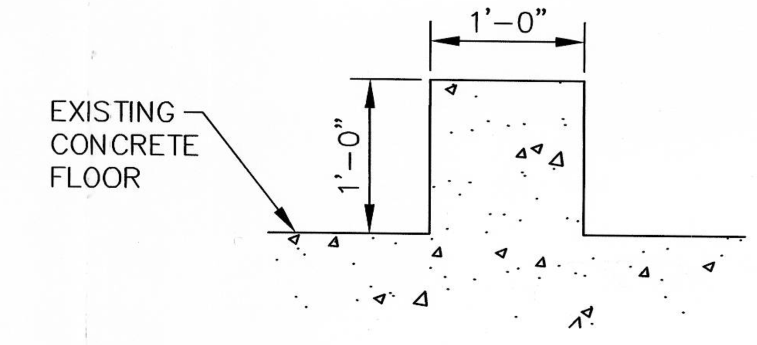
TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
BUILDING C – DIKING AND RAMPS

DRAWING NO. C 500 REV. A

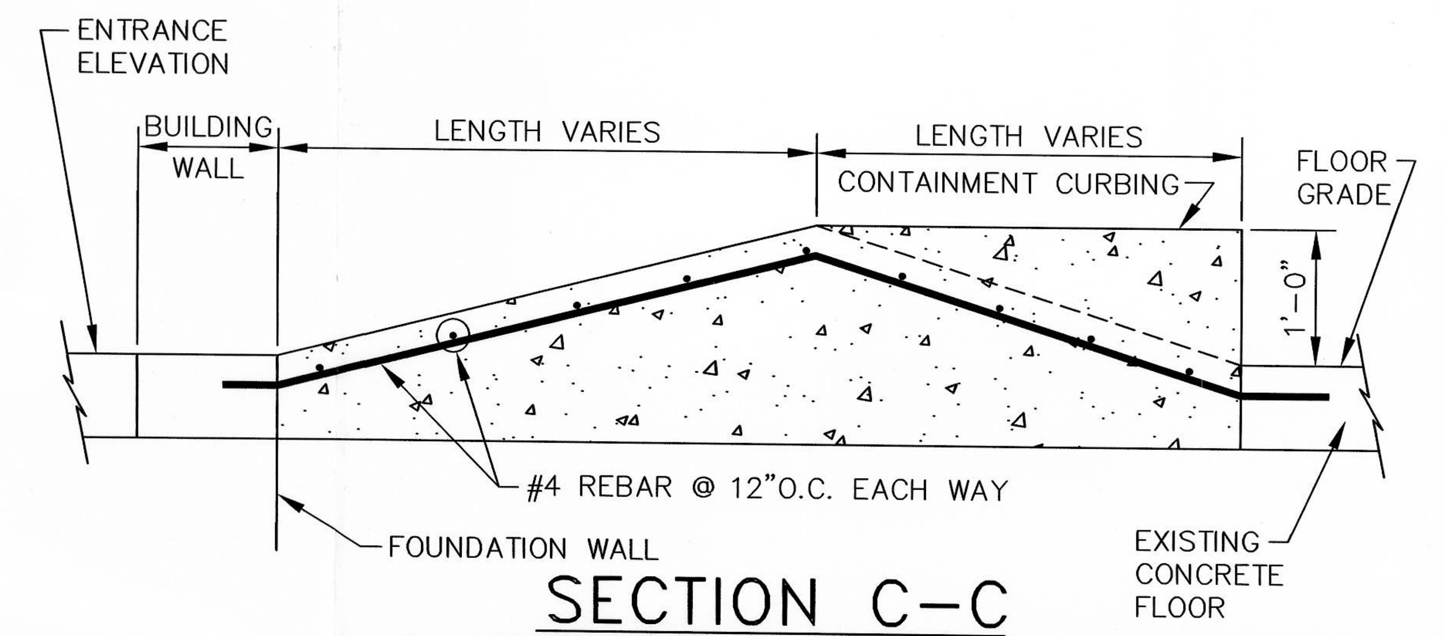




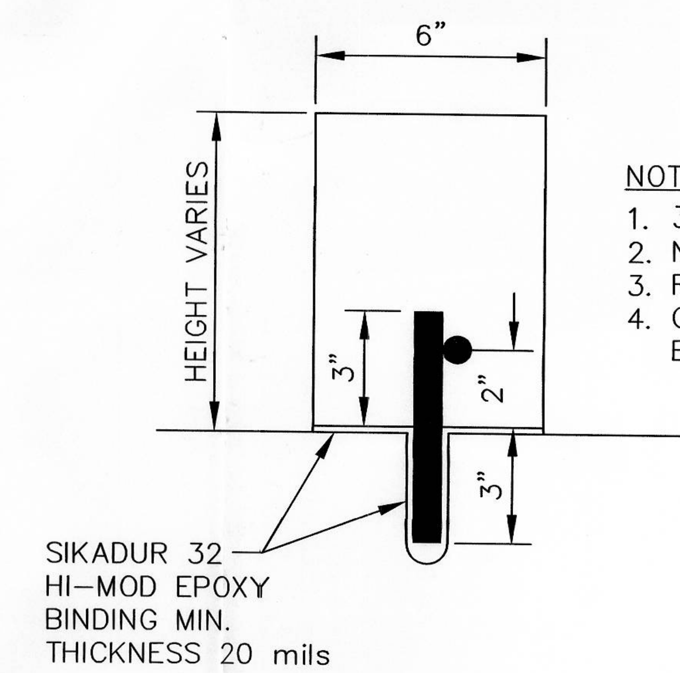
SECTION A–A
TYPICAL CURB CROSS SECTION
SCALE: 1"=1'-0"



SECTION B–B
TYPICAL CURB CROSS SECTION
SCALE: 1"=1'-0"



SECTION C–C
TYPICAL CONCRETE RAMP CROSS SECTION
SCALE: NONE



SECTION D–D
TYPICAL DIKE CROSS SECTION
SCALE: 3"=1'-0"

NOTES:
1. 3,000 psi CONCRETE.
2. No. 4 REBAR ON 24" CENTERS.
3. RAMPS FURNISHED AND INSTALLED BY HRI.
4. CONCRETE TO BE SANDBLASTED WHERE EPOXY BONDING GOES.

FIGURE D–3

REFERENCE DRAWINGS

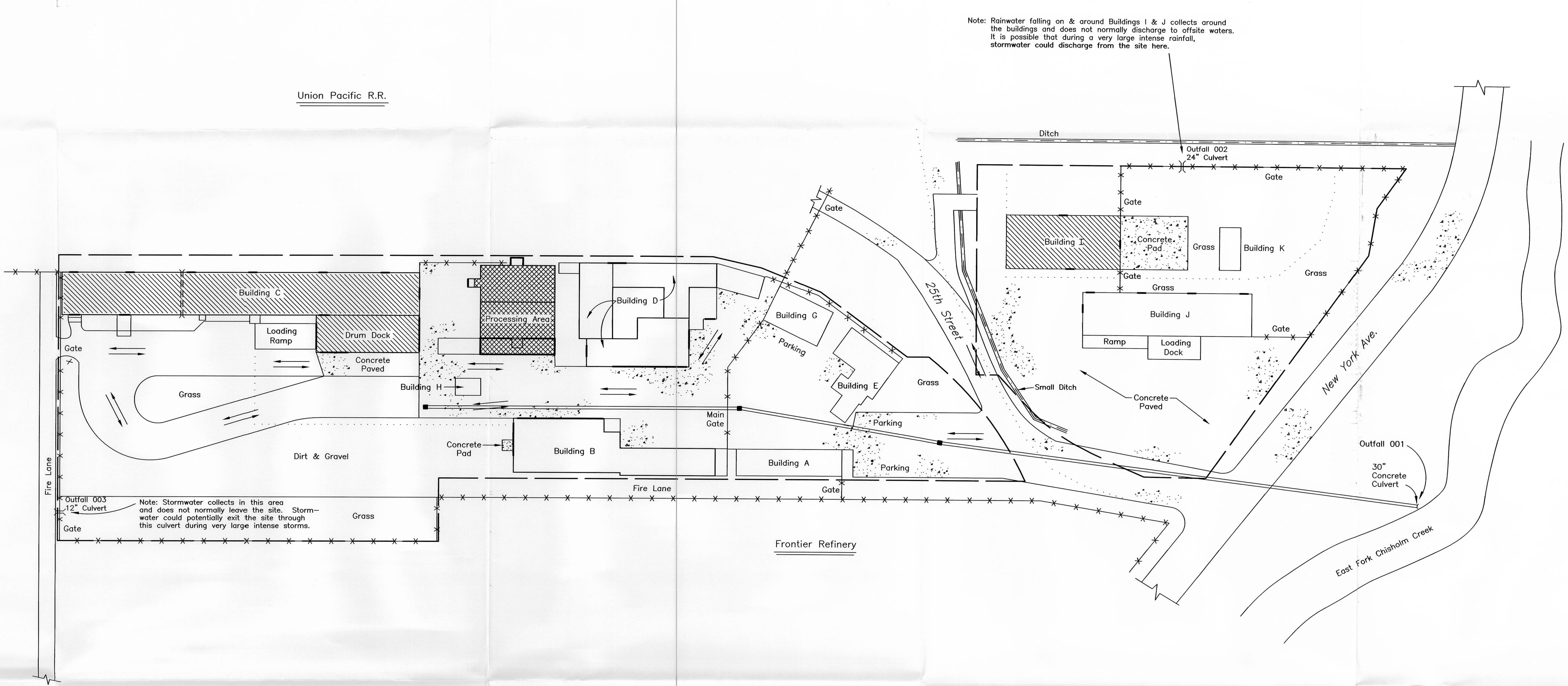
REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	RCRA PART B SUBMITTAL	K.M.C.	7/2/08	M.C.

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	3/16"=1'-0"	06/26/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
PROCESS BUILDING

DRAWING NO. P 200
REV. A



Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Container Storage Area
- : Container and Tank Storage Area
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes

N

50 0 50 100

SCALE OF FEET

FIGURE D–2

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

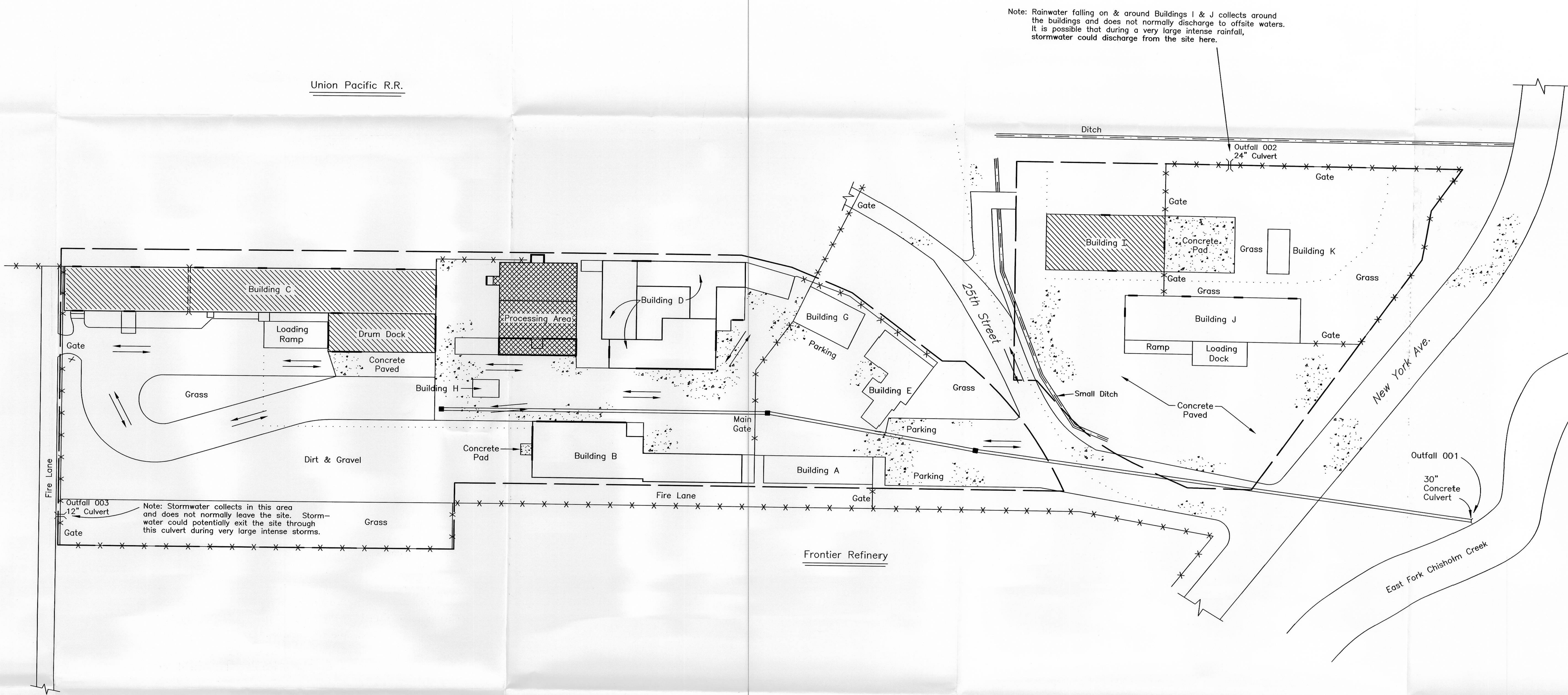
CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
SITE PLAN

DRAWING NO. WICHSITE

REV. C



Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

: Railroad Tracks
: Fence
: Property Line
: Container Storage Area
: Container and Tank Storage Area
: Loading and Unloading Area
: Secondary Containment Berm or Wall
: Pavement
: Drainage Boundary
: Storm Drain Catch Basins
: Underground Storm Sewer Line
: Truck Routes

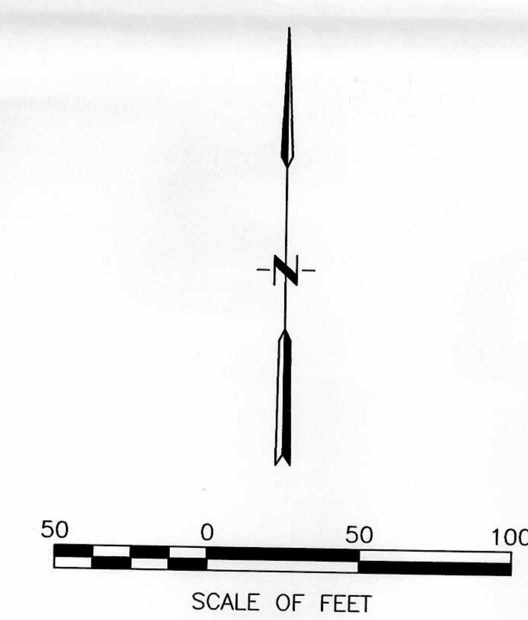


FIGURE D-1

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

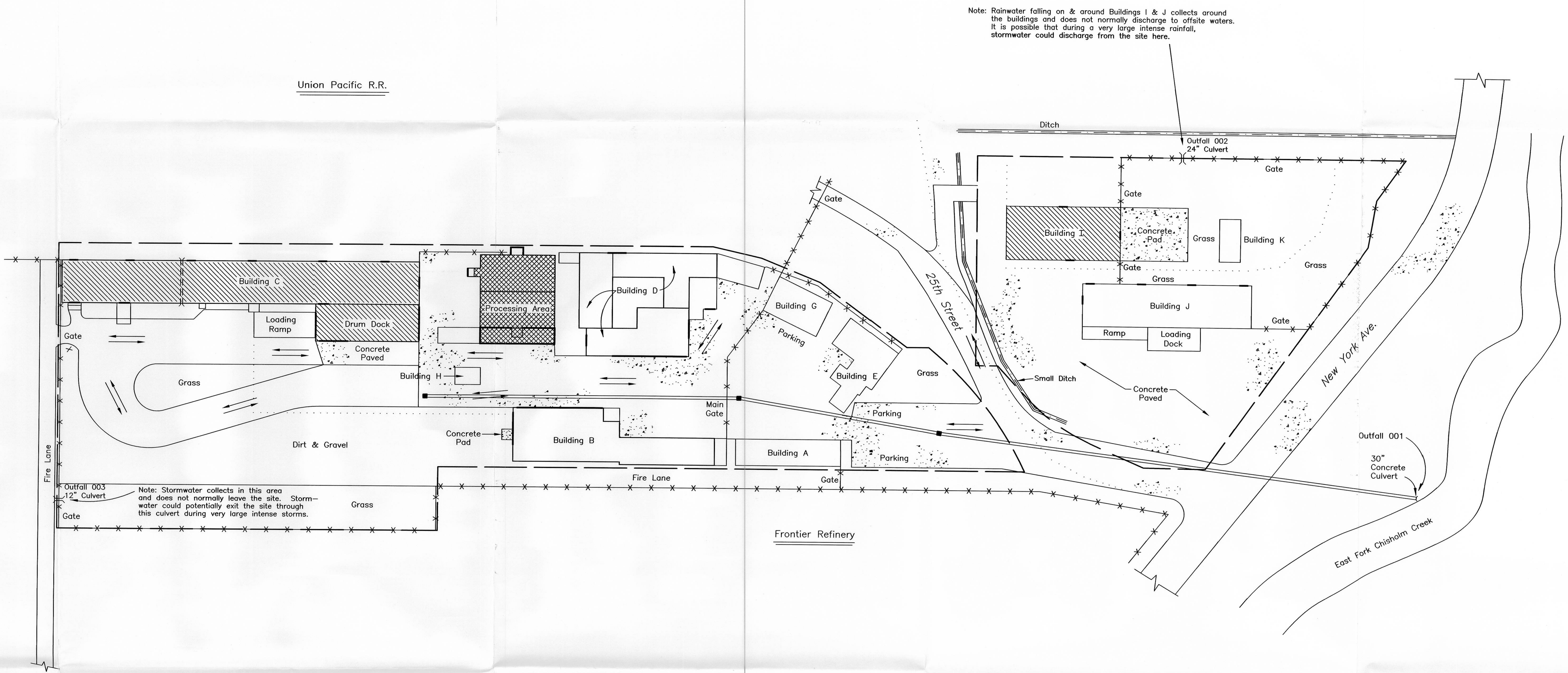
CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
HAZARDOUS WASTE MANAGEMENT AREAS

DRAWING NO. HWMA

REV. C



Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Container Storage Area
- : Container and Tank Storage Area
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes

N

50 0 50 100

SCALE OF FEET

FIGURE B-4

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

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DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
HAZARDOUS WASTE MANAGEMENT AREAS

DRAWING NO. HWMA

REV. C

Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Container Storage Area
- : Container and Tank Storage Area
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes
- : Stormwater Flow Directions

N

50 0 50 100
SCALE OF FEET

FIGURE B–3A

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE
CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
SITE PLAN
STORMWATER FLOW DIRECTIONS

DRAWING NO. WICHSITE
REV. C

Building Legend

Building A	Laboratory/Administration
Building C	Hazardous Waste Management Building
Building E	Administration
Building G	Personnel Decon/Break Room
Building H	Operations Office
Building I	Hazardous Waste Management Building
Processing Area	Hazardous Waste Management Area
Drum Dock	Hazardous Waste Management Area

Legend:

- : Railroad Tracks
- : Fence
- : Property Line
- : Container Storage Area
- : Container and Tank Storage Area
- : Loading and Unloading Area
- : Secondary Containment Berm or Wall
- : Pavement
- : Drainage Boundary
- : Storm Drain Catch Basins
- : Underground Storm Sewer Line
- : Truck Routes

N

50 0 50 100

SCALE OF FEET

FIGURE B-3

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
D	RCRA PART B SUBMITTAL UPDATE	K.M.C.	9/3/10	S.A.B.
C	RCRA PART B SUBMITTAL UPDATE – ADDED FLOOD ZONES	K.M.C.	4/3/09	M.C.
B	RCRA PART B SUBMITTAL UPDATE	K.M.C.	3/27/09	M.C.
A	RCRA PART B SUBMITTAL	K.M.C.	6/20/08	M.C.

REFERENCE DRAWINGS

CleanHarbors®

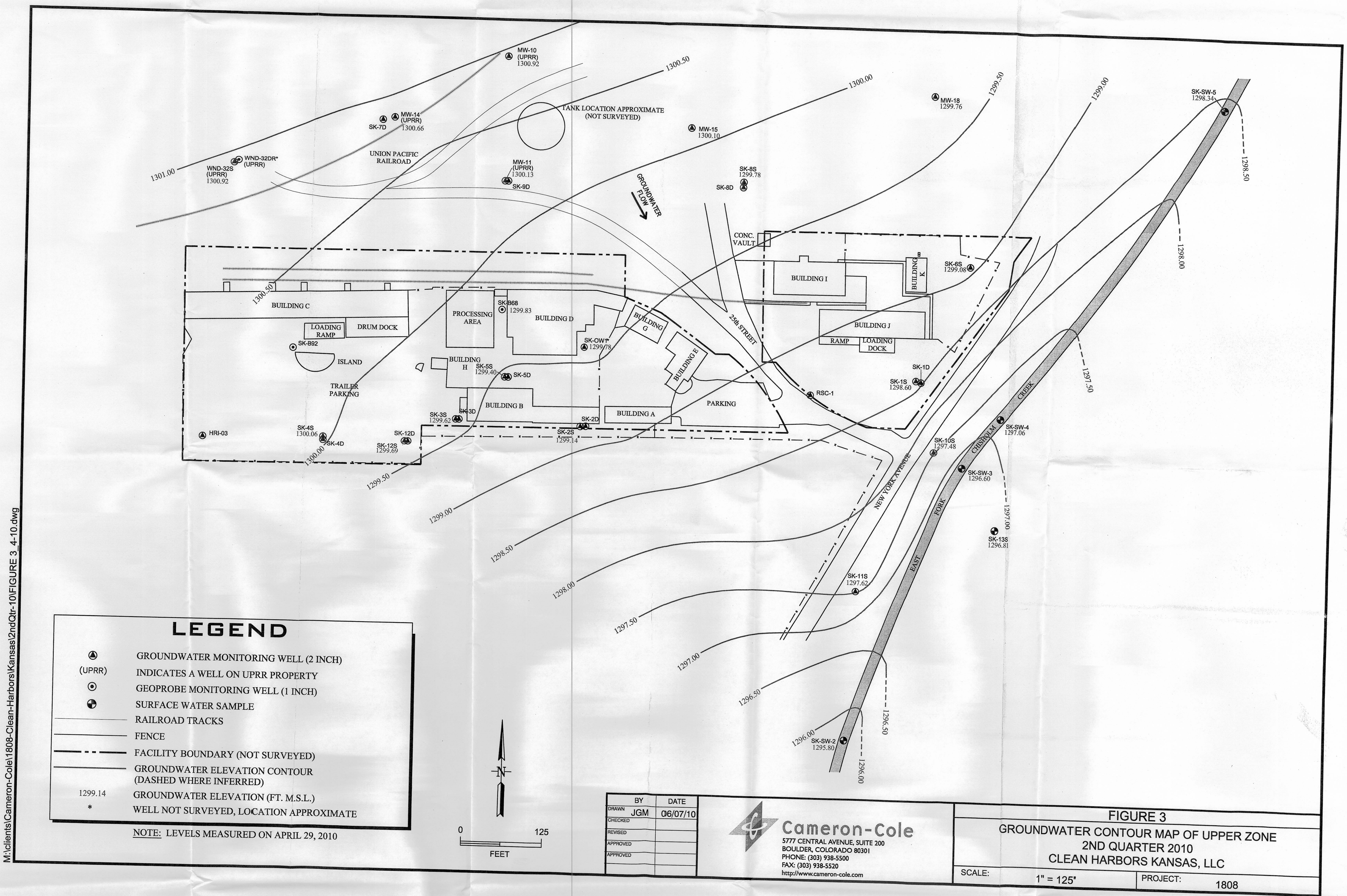
DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.C.	AS NOTED	04/01/08

TITLE

CLEAN HARBORS KANSAS, LLC
WICHITA FACILITY
SITE PLAN

DRAWING NO. WICHSITE

REV. D



M:\clients\Cameron-Cole\1808-Clean-Harbors\Kansas\2ndQtr-10\FIGURE 3_4-10.dwg